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FEATURES

Mobiles: Voice just an option

- AMPs to GSM to CDMA
- Digital standards, paging, Web voice and satellite

The Bionic Banker:
County's Nick Birrell

FIRST TAKE

- Intuit Quicken 7
- Mac OS 8.5
- Corel WordPerfect 8 for Linux
- USB peripherals
- Partition Magic 4.0
- Gateway Solo 3100
- Acer TravelMate 310
- Diamond Monster MX300
- Creative Sound Blaster Live

WORKSHOP

- Overclocking processors
- New series: Java
- Inside video cards
- Linux as a modem server

Plus Windows 95, OS/2,
MacOS, Developers Corner,
Shareware and more

ALSO IN THIS ISSUE:

- Price Watch: Voodoo2 graphics cards • Magazines: Why they're not online • Image manipulation: The digital lie

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- Top 20 speed boosters for your PC
- Bandwidth Busters — NT 4.0 SP 4, Office 97 SR-2

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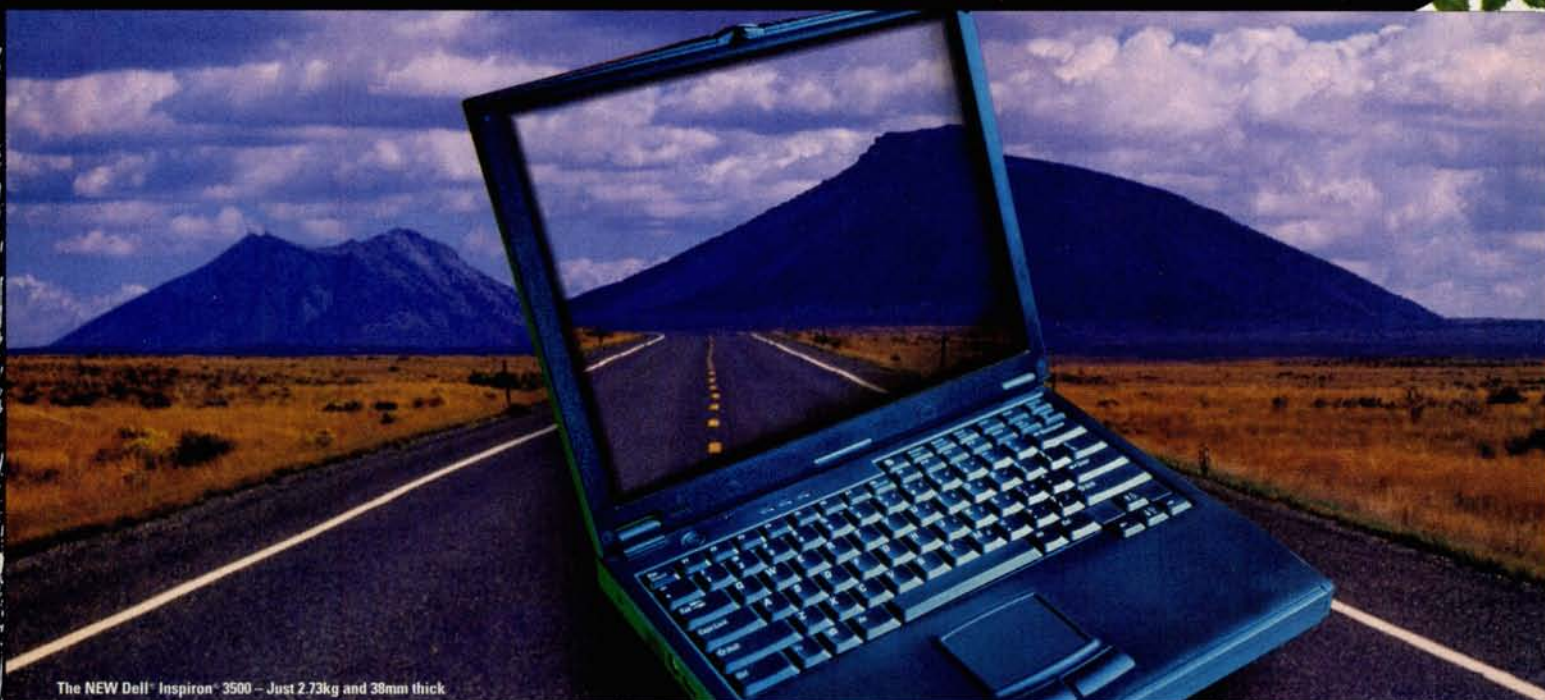
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- 128-bit Graphics Accelerator
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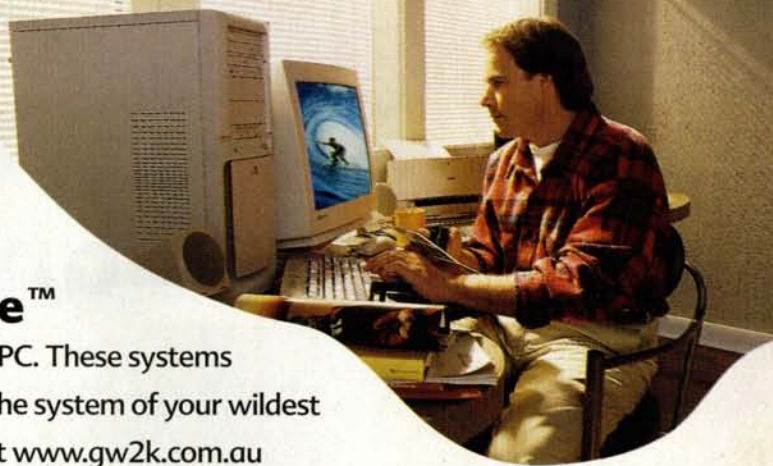
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- 2.5MB 256-bit SGRAM Graphics
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- External 1.44MB Floppy Disk Drive
- Integrated 8xMin / 20xMax CD ROM
- 56k Fax/Modem
- 8-cell Lithium Ion battery & AC Adapter
- MS® Windows® 98
- MS® Office 97 SBE+

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Now try it with Your:)Ware

Above system + trade-in +
8 hr/mth Net Access **\$36/wk**
or Unlimited Net Access **\$42/wk**

The Great Mate (Solo 5150)

- 14.1" Active Matrix Display (TFT)
- Intel® Pentium® II Processor 233MHz
- 32MB SDRAM
- 512k Level 2 Cache
- 2.5MB 256-bit SGRAM Graphics
- 2GB Ultra ATA Hard Drive
- Modular 1.44MB Floppy Disk Drive
- Modular 8xMin / 20xMax CD ROM
- 9-cell Lithium Ion battery & AC Adapter
- MS® Windows® 98
- MS® Office 97 SBE+

\$4,199 Inc Tax

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Above system + trade-in +
8 hr/mth Net Access **\$39/wk**
or Unlimited Net Access **\$44/wk**

The Wizard (Solo 9100)

- 14.1" Active Matrix Display (TFT)
- Intel® Pentium® II Processor 300MHz
- 128MB SDRAM
- 512k Level 2 Cache
- 4MB SGRAM Graphics
- 8GB Ultra ATA Hard Drive
- Combination DVD/LS120
- 56k Fax/Modem
- 12-cell Lithium Ion battery & AC Adapter
- MS® Windows® 98
- MS® Office 97 SBE+

\$8,199 Inc Tax

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Above system + trade-in +
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or Unlimited Net Access **\$76/wk**

Your:)Ware



Customised Hardware

With Your:)Ware, you get to choose exactly what you want.



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The computer built for you today will still be useful tomorrow because if you choose Internet access or finance you can trade it in towards a new one every two years. How's that for keeping current?



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Want to get on the Web? gatewaynet will get you there fast. Just push a button and you're surfing the Net on a PC built to handle it. Can we help you with anything else?



The Right Software

Tell us who the PC is for and we'll build it with the right software.



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Gateway Support means you'll get quality service from the time we help you build your PC, and for the life of your computer! 3 year warranty. 30 day customer satisfaction guarantee and lifetime toll-free phone support. It's covered!



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What's it going to cost you? It's all yours for a low weekly payment. It's not a lease, you own the PC from day one!

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www.gw2k.com.au

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• And now at the Telstra Shop, Westfield Miranda

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NEW!

The Internet and Much More!

The Internet and Much More
13 channels
Exclusive areas just waiting for you!

Okay, so you've got your computer, your modem, a telephone line and a groovy mousemat. Now it's time to take the plunge and get online. Will it be a slow, torturous process involving long periods of time spent staring at a status bar or will you simply insert the CD, press a few keys and hit the great world of online services and Internet access? Smart users know the answer lies with AOL.

Not only do you get a fun, affordable, easy to use information service that lets you communicate with your

friends and family the world over, but you also get all this free for a month when you trial the AOL service. That's 100 FREE HOURS to spend online exactly as you like and you'll be online in minutes!

AOL is now the most popular online Internet service, with a global membership of over 13 million members. It brings you far more than the Internet, thanks to a vast selection of exclusive areas, containing quality content that you just can't access on the Net. Grouped with 13 main channels, you'll find news, sport, entertainment, email, computing, travel information, weather forecasts, online AOL chat areas and loads more. You'll never need to be out of the loop or at a loose end again.

GETTING STARTED

You don't need a Ph.D. to sign on with AOL - insert the cover CD, go to

ISP's then click on AOL. Then follow the simple instructions on the "100 free hours" brochure enclosed (which features your unique registration and password number) and you'll be online in minutes! The Welcome screen gives you a news headline and three buttons to click on when you fancy a visit to somewhere new. Alternatively, you can browse through the main menu, using Channel buttons to take you directly to the area's you're interested in.

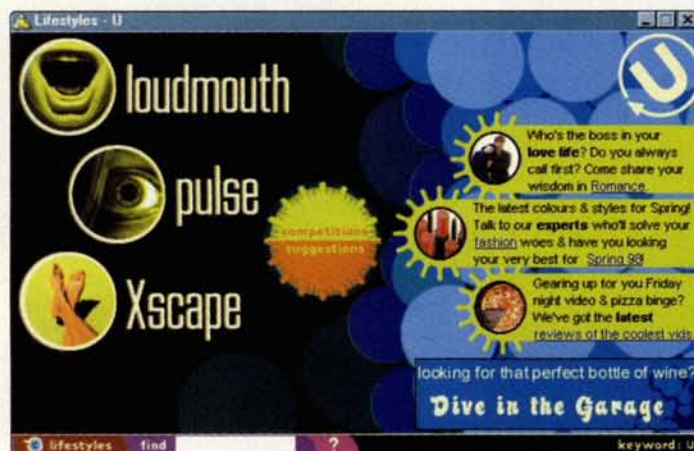
In addition, you access content and interact with members of the other AOL global services simply by clicking on the International channel, whether it be in the USA, Canada, Germany, UK or maybe even France.

IT'S BETTER WITH BUDDIES

Great news for couch potatoes - you

can link with family and friends and the rest of the world without having to leave your armchair. As an AOL member, you get your own email address and the facility to send messages worldwide. Fancy a change in personality? You can choose up to five screen names on your account (each act as a password protected email address), which also makes the service great for family members who each want their own privacy.

AOL always goes the extra mile and online communication is no different. Buddy Lists are an exclusive, innovative way to personalise communication. By choosing your nearest and dearest fellow AOL members for inclusion on your personal "Buddy List" you will be alerted if your friends (and enemies) are online at the same time as you. You can then choose to communicate quickly and easily, by sending an "Instant Message" which pops up on



100 Hours FREE Internet Access

their screen as soon as you've sent it. You can even decide to go to a private chat room, where you can gather up to 23 of your closest friends and family - great virtual parties.

SEAMLESS SURFING

Internet access is seamlessly integrated into AOL. It's easy to go directly to great Web pages - just click Find on the AOL menu bar, type in the address and you're there - it really is that simple! Handholding is available to beginners, with guides to life online and directions to all the best sites. You can even make yourself a permanent fixture in cyberspace and publish your own site with AOL's easy to follow tutorial.

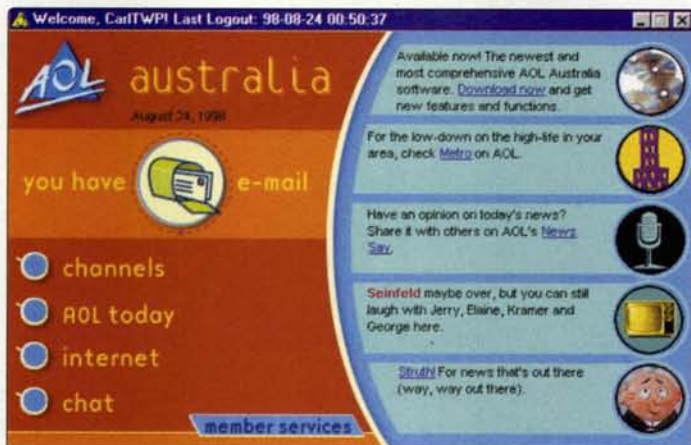
PARENT POWER

Parental Controls make AOL parent and child-friendly. AOL offers a safe and secure family environment in its online areas and in addition, it gives parents powerful yet easy to use tools for controlling the online environment for children. Not only this, but AOL has its own set of 'Rules of the Road' or terms of service, which members must follow while online.

And finally, if you're ever in need of help - don't worry. Get answers to your questions about AOL from the Member Services team either online or for free customer support over the phone call 1300 654 633.

Explore the Internet PLUS the world of AOL for yourself FREE this month with our special reader offer - one month's FREE AOL membership including 100 hours online! Everything you need is enclosed with your CD so why not get yourself online in minutes for FREE now!

If your disk is missing from the front, or you have a friend who would like the chance to try AOL, simply call 1800-265-265, and we'll send a FREE trial disk of AOL so you can experience AOL - The Internet and Much More.



WHAT'S UP FOR GRABS!

- FREE - 100 hours online
- FREE - one month's membership!
- FREE - software!
- FREE - 10Mbs Web space!
- FREE - five email addresses!
- FREE - technical support!

Ten Cool Hits With AOL

- 1 All aboard the AOL Tour to ensure you see all the sights in Australia and around the world.

Let us take you on a journey through the 13 channels of AOL. Visit our vast selection of exclusive areas, and just by clicking the International Channel you have access to our services worldwide!

Join the AOL community and see why over 13 million members subscribe to AOL. Send unlimited email, check out online news, download a variety of new software or go behind the scenes of movies & TV shows. Sit back and enjoy the ride...Bon Voyage!

KEYWORD: AOL TOUR
KEYWORD: INTERNATIONAL

- 2 AOL brings you the latest in Internet technology. Check out AOL's powerful new search engine AOL NetFind™ - the easiest, most comprehensive way to find what you are looking for - fast!

Whether you're looking for sound files & graphics or Web sites, AOL NetFind™ can help you find it. And with Microsoft Internet Explorer 4.0 as your integrated Web browser, it's easy to explore the web for all your information needs.

KEYWORD: INTERNET

- 3 AOL keeps you in touch around Australia and around the World. With AOL it's easy to send and

receive email with your own personal touch! Plus every AOL account comes with 5 separate email addresses - one for each member of the family. Get creative - choose from a huge range of background & text COLOURS - use BOLD or Italics - Send your family, friends or associates notes, files, hyperlinks to a website or even your own photo - it's easy.

Send an instant message to all your friends online by setting up your Buddy List™ - a bit like an interactive post-it-note.

KEYWORD: EMAIL

- 4 AOL brings you News & Sports - the moment it happens

NEWS: Check out the News channel and you'll find the latest headlines and in-depth articles of Local, National and World Importance. There are web links to online newspapers from around the world, from New York to London or Australia just to name a few.

SPORTS: Get the news on Sports, enjoy game highlights and player profiles complete with photos, rumours and competitions. You can even chat with your favourite International sports stars that feature on AOL Live!

KEYWORD: NEWS
KEYWORD: SPORTS

- 5 AOL Online Fun & Fact for the Family

Fun: AOL's Entertainment channel lets you tap into the latest Hollywood gossip, movie reviews and lets you keep in touch with the latest arts & entertainment listings each week.

Facts: AOL is dedicated to bringing you & your children a world of education & learning. There's online study notes, homework help and carefully selected Kids Internet sites.

KEYWORD: ENTERTAINMENT
KEYWORD: LEARNING

- 6 Globetrotting on AOL

Going on a holiday? Don't leave home without checking AOL for all your travel essentials. Whether it's flight times & foreign exchange, or travel guides & tourist information - you'll find it all at AOL's Travel Channels both in Australia & around the world.

KEYWORD: TRAVEL

- 7 AOL keywords for quick access

Click on "Find" on the menu bar for a quick and easy way of accessing areas on AOL. It works like an index tab, allowing you to go straight to an area, rather than navigating by using the menus and submenus. Simply type in the AOL Keyword press enter - and you're there.

KEYWORD: KEYWORDS

- 8 AOL lets you rest easy with Parental Controls for your family's added security. Worried about what your kids might be able to access? Rest assured this will be

completely within your control on AOL.

- Set your own limits for which AOL and Internet areas your kids have access to - you can block various types of access to the Net, such as downloads from Newsgroups, Chat rooms, or you can block all Internet access, so that kids can play safely.
- All kid's Chat areas are also chaperoned by AOL 'guides'.

KEYWORD: PARENTAL CONTROLS

- 9 AOL helps you build your own website

With your AOL account you are given a generous 10Mb of Web space, so why not create your own personalised Web site - AOL even provides online tools to help you with this! Enter your own text, provide your own links, include your favourite sounds or other multimedia files and even a picture of yourself!

KEYWORD: MY PLACE
KEYWORD: AOL PRESS

- 10 Get A Life. Cliques and Communities - everything from teenagers to Grandparents. There's International Forums, Women's Forums, a Writers Group and a Gay & Lesbian area. These are just some of the areas where you can chat to like minded people from around the world on topics that are of interest to you. Great new friends are now just a mouseclick away!

Your free trial must be used within one calendar month of your initial sign-on. Free trial does not include telephone connection charges. The pricing plan is outlined online. Access to AOL requires a credit card. To use AOL you must have a 486 PC or higher, 16MB of RAM, 25MB of HD, a VGA monitor (256 colour support recommended), a mouse, a modem, a CD ROM and a copy of Windows 95 or 98. You must be 18 years or older. Limit of one free trial per household. Offer only available in Australia. Free trial must be used by 1/4/99. Access to and usage of AOL is subject to terms and conditions, which are available, online. AOL Bertelsmann Online Services is located at Level 5, Tower A, Zenith Centre, 821 Pacific Hwy, Chatswood NSW 2067

AOL-DP00001



Vanity work

There's something worrying about the gift economy.

By Jeremy White

It's easy to be insular when you work with computers and technology. Even if you don't intend to, without too much conscious effort, you can end up sitting for hours at a time staring at a screen, largely alone with your thoughts, and dealing with other humans through the filtered glare of a cathode ray tube and a messaging program.

The more interesting and involving your own work, the easier it is to become buried in it. And technology is interesting stuff. Every hour of every day there seems to be something new and exciting — some new toy to play with, some sea change in the whole way technology is used, or some significant advancement in the way technology impacts on society.

You can even see this with APC — a monthly magazine is no longer enough for the editorial team or our readers, either in its timeliness or its depth. As you're probably aware, we're now producing a number of new titles: **CD Week** is essentially a weekly magazine, our **apcmag.com** site and new **NewsWire** site in particular deliver constant real-time updates, and our new **apcmag.pocketbook** series delivers a hundred or more pages on a single topic. I mention these not as a plug, but as one example of a much broader trend. If you're interested in technology, it's easy to become immersed by the infinite minutiae of its incremental advances.

As a casual consequence, rather than a conscious result, I think there is a real danger that you can neglect more human interaction. All of a sudden it's weeks or months since you last spoke to a good mate, your family can't remember what you look like, and your work mates have given up trying to coax you down the pub.

I can be somewhat guilty of this myself at times, but it seems to me almost symptomatic of people who have a passionate interest in technology.

Of course, when you take a step back, you kind of realise that although things are moving, they don't really move as fast as you think.

And perhaps, sometimes, just a little, people on good incomes with expensive equipment, who can connect to the Internet from anywhere in the world over their cellular modems from their new notebooks, forget about the world that doesn't connect.

APC's offices are in the heart of Sydney near Hyde Park. All around us the city has gone into a pre-Olympic development orgy. Footpaths are being widened while retailers are put out of business by the hoardings. Traffic is brought to a standstill while new plazas are constructed. And long-standing block-wide empty construction pits are sprouting skyscrapers like feral weeds.

But Hyde Park is also a congregation point for many of Sydney's homeless. When I first started working in the city as a cadet, I was quite shocked that the world passed by people, without shoes or clothing, who were sleeping on the sidewalk. Now I run into the building late for a meeting or with a mountain of work to finish, and don't even notice the bag woman or the old guy with torn trousers.

Turning the other way is by no means restricted to the IT industry, but the abstract nature of its focus means, I think, that the IT industry as a whole finds it easy to do the same thing.

Even the politically correct parts of IT suffer from the problem.

Take OSS (Open Source Software). I've been following the recent Halloween I and II imbroglio in which a Microsoft internal memo outlining the threat to Microsoft from OSS and Linux was outlined, and the analysis of it, in particular Eric Raymond's 'The Cathedral and the Bazaar' and 'Homesteading on the Noosphere'.

One of the philosophical drivers behind OSS is the belief that among developers and

people in IT there is now no scarcity of income or resources — job security is just a question of how long you stay in your current position before the next poaching, and resources are equipment and bandwidth. This leads to the creation of a "gift economy", in which people essentially work for status and vanity — in particular coding open source free software.

Something really worries me about this, and I think I've put my finger on it.

Now, I really don't want this to be just a bleeding heart guilt-sating whinge about corporate greed or the gulf between rich and poor. I've got a lot of respect for Microsoft and IBM's capacity to turn a dollar. I'd like to have a Murdoch or Packer nose for a quid. And admittedly I don't think this phenomenon is as yet very widespread. But something really worries me when people working in IT have such high perceived job security, high incomes, and ready access to technology that economic motivations start to take second place to vanity.

Thankfully, I think this is still largely a US and Euro phenomenon — most of the people I know who work in this industry in Australia are down to earth, and very focused on more traditional hierarchies of need.

There's no doubt when you look at Linux that the free-for-all vanity approach to development is producing better software. And there's no question that open software development is intellectually a far superior approach than closed shop development.

But what does it say about IT when the hierarchy of needs of the people in that industry has become so abstracted that productive effort is aimed at satisfying ego ahead of earning a crust? And what does that say about the gulf between the technology rich and the rest of the world?

You can reach Jeremy White at
jwhite@apc.com.au.

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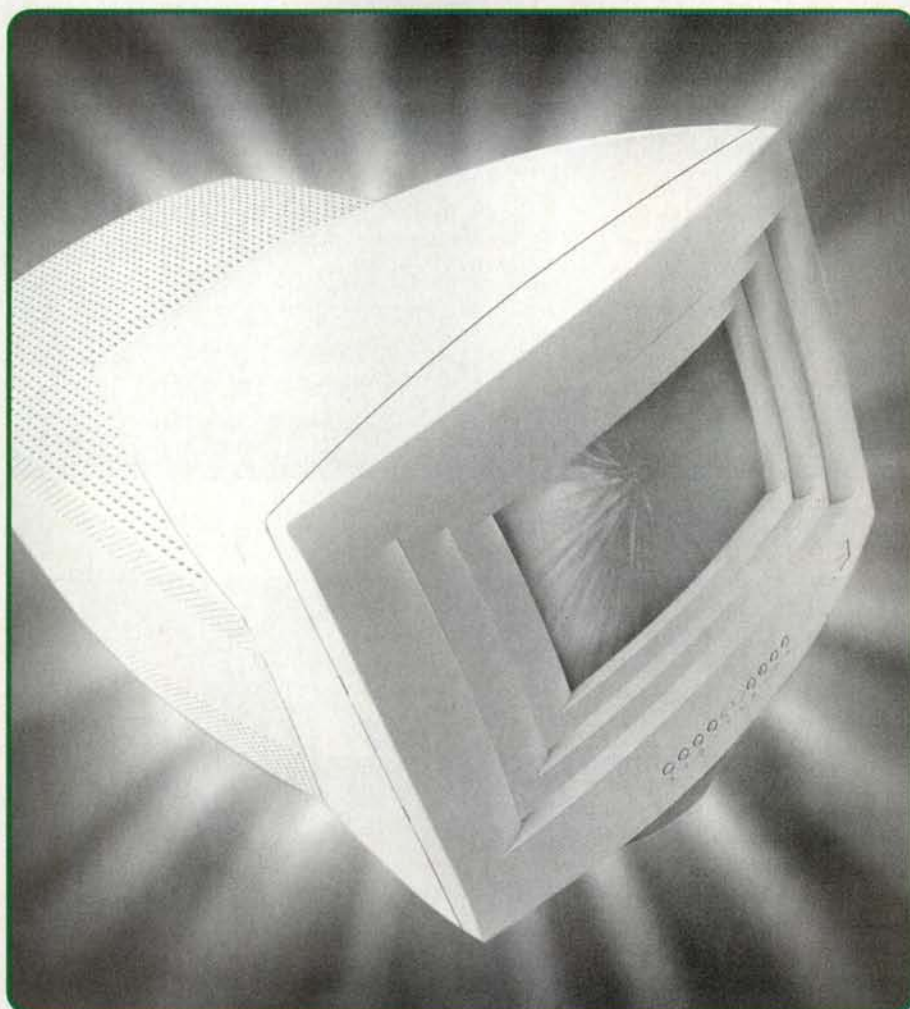
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RED HOT PCs

It's almost Christmas, and what could be jollier than sitting down in front of a PC that's still sparkling and fresh from the box? But before venturing into the wide world of PC shopping, you should read the in-depth reviews in this issue, because we've done all the hard work. We take a look at 10 systems that won't blow your budget, and 13 that will blow your mind. 102

For our budget category we stipulated a price ceiling of \$2,000 to keep the competition tight and focused. What we ended up with were some astonishingly well equipped systems at a killer price. 104

We threw the specification doors wide open for the ultimate category. Generally the vendors didn't disappoint and furnished us with great mix of powerful corporate performers and gamers' dream machines. All in all, a red hot read. 124



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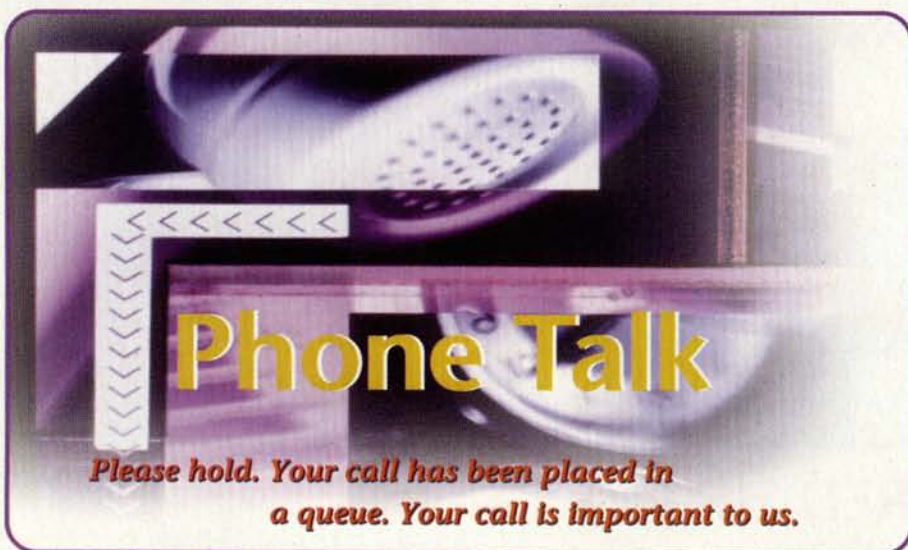
BANKING ON BIOTECH

Instead of playing catch-up in infotech, Nick Birrell suggests Australia might be better served anticipating the next revolution – biotechnology, the emerging industry uniting medicine, genetics and information technology – but only if we start exploiting our advantages.

By Dan Tebbutt

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Multimedia-enabled mobile communications devices are just around the corner.

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Cash Management and The First State Advantage.

Colonial First State delivers consistently higher returns by charging lower

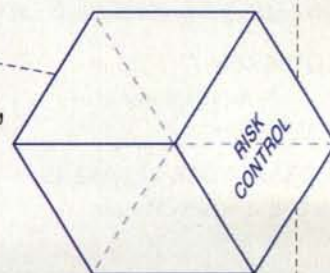
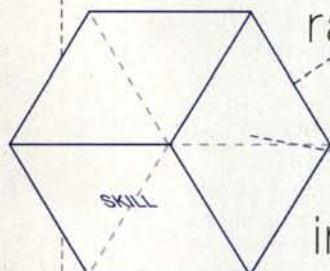
Colonial First State Premier CMT	4.4%
BT	4.0%
MLC	4.0%
MACQUARIE	3.9%

One year performance to 1 October 1998, net of management fees, assuming all distributions reinvested. Source ASSIRT.

fees on its Premier Cash Management Trust. Investors also enjoy zero entry and exit fees, free

cheque book, at-call access and AAAm rated security. Investments start from just \$20,000. To apply the First State Advantage to your investments, consult your financial adviser, call 13 13 36,

mail the coupon or visit our website at www.colonialfirststate.com.au



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APC/DEC/98



Colonial.

First State Investments

The First State Advantage.

The fund manager is Colonial First State Investment Managers (Australia) Limited ACN 002 348 352, who receives a management fee. Initial applications for the Colonial First State Premier CMT can only be made on the form attached to the prospectus dated 1/11/98 lodged with the ASIC. CFM 5954

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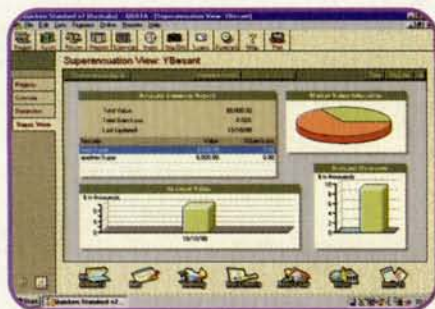
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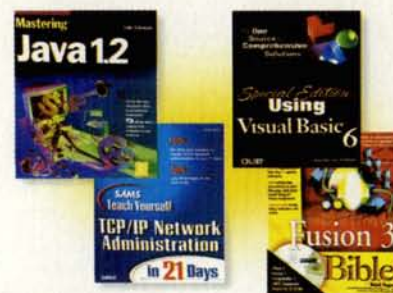


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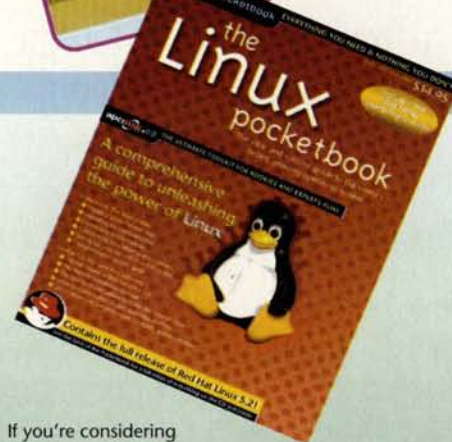
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If you're considering tackling the penguin, the **Linux Pocketbook** is for you. All the resources you need to explore the world of Linux — the world's fastest growing operating system. Includes the full release of Red Hat Linux 5.2. **On sale NOW!**

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Western Digital introduces the NEW EIDE Standard (Again)....With the Ultra ATA 66 13 GB hard drive.



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This month on APC's cover CDs

DISC 1

TOP 50 FREWARE PROGRAMS

3D Sync 2.21, Audiograbber 1.31, BCWipe 2.15, Birthdays and Such 1.03, Bookmark Converter 2.5, Calmira 2.2, Clipboard Magic 1.32, Conversion Calculator 1.0, Cyber Kit 2.3, Dialog Killer, DynamoDNS 2.1.0, EasyMTU 1.03, Electronic Assistant Lite 2.1, ExamDiff 1.6, Forte Free Agent 1.11, FreeZip 1.4.6, Hot Spot, In Control, LiteStep 0.24.1, Luckman's Anonymous Cookie, Macro Mania 3.53, Microsoft Chat 2.1, MP3 Manager 4.0, NetLaunch 3.14d, and more



SPEED BOOSTERS

CD-Quick Cache, Dr Hardware, WinTune98, Windrenalin, MemTurbo, APK RamCharge, Cacheman, Cybermedia Uninstaller, DNTTools, SysEnhance II TweakIt, Omniquad Active Interface, Diskeeper (for Workstation), DriveSpeed, FastDisk Slow Copy, FastVid, 6x86 Configuration, Waterfall Pro, Rain

BANDWIDTH BUSTERS

Microsoft NT 4.0 Service Pack 4, Microsoft Office 97 SR-2, Illustrator 8, Photoshop 5.0, Netscape Communicator 4.5

NEW & HOT

Adobe ImageReady, HTML Assistant Pro 97 1.0.5, CyberSecretary 1.1, Screen Thief 98 1.0, Bootlock 2.0, Main Actor 2.05, Desktop Themes 1.84, Hagai's Bug 2000 checker, Album Toolkit 1.4, BrowserSizer 1.02, ColdFusion 4.0, Text to Web converter, Extensis PhooTools 3.01, Directory Compare 6.0g for Windows 95, DragThing 2.6, HVS JPEG 2.0, MSNBC News Alert, ARDI Executor 2.0

BROWSERS

Netscape Communicator 4.5, Netscape Communicator 4.07, Netscape Navigator 4.07, Microsoft Internet Explorer 4.01a SP1, Microsoft Internet Explorer 3.03, Microsoft Internet Explorer 3.02

DISC 2

THE SUPREME GAMES COLLECTION

Age of Empires Expansion Pack: The Rise of Rome Real, Balls of Steel, Descent Freespace: The Great War, Heretic II, House of the Dead, Jagged Alliance 2, Longbow 2, MechCommander, Motoracer 2, Oddworld: Abe's Exodus, Railroad Tycoon 2, Shogo, Small Soldiers, StarCraft, Total Annihilation, World Cup 98

PATCHES AND UPDATES

Descent Freespace: 104 Update, Descent Freespace: Server Update, Heretic II, Longbow 2 Display Driver Update, Longbow 2 Version 209 Update, Longbow Gold 3Dfx Update, MechCommander 1.8 Update, Shogo 1.1a Patch, Starcraft 1.03, Total Annihilation

DISC 3

TOP 200 DOWNLOADS OF 1998

BUSINESS TOOLS

Above & Beyond 98, Ace for Windows 4.01, Address Book 4, Brainstorming 101: Ideas for Excellence 1.4, Chronilist 2.7, Electronic Assistant Lite, Expense Report 98 2.0, FooBar 1.0.2, Gaby 0.1.2, Jot+ Notes 2.1.1, jourmyx Time, and more than 10 other essential business tools

DESKTOP AND SHELL TOOLS

Crowd Control 1.3, Desk Pack 98 1.0, Desktop Themes 1.84, DlgXRSizer 2.1.1, Easy Control, 4Screens 1.27, HideWindows 1.1, LiteStep 0.24.1, Microangelo 98 4.72.3110a, and more



EDUCATION AND KIDS

3D Castle Creator, Animated Arithmetic 1.0, Animated Beginning Typing 1.1, Elmo's Preschool Deluxe, FasType for Windows 5.3, KKGames 1.05, and more entertaining downloads

File Management Tools

Advanced Disk Catalog 1.20c, CopyTo 2.11, Default Folder 2.9.3, Directory Compare 1.1, Directory Printer 2.0, Directory Toolkit for Windows 95/NT, and 12 more organisational tools

HOME AND RELAXATION

Athlete's Database 3.0, Baby Bits, BarBack for Windows 4.0u, Chore Genie 2.0, Classified! 97, Coffee 1.1, Cross Stitch Professional 6.24, Cross-stitch Designer 4.02, Cumberland Family Tree for Windows 95/NT 2.31, Design Your Own Home: Interiors, Design Your Own Home: Landscape, plus 10 more hobbyist delights

INTERNET AND NETWORK

Advanced Dialer 1.2, CU-SeeMe (32-bit) 3.1.1 build 16, CuteFTP, CyberKit 2.4 beta 5, DNTTools 1.2, Download Deputy (PPC) 3.1, Free PPP 2.6.2, GetRight, Go!Zilla, and more

MULTIMEDIA AND DESIGN

Acid WAV 1.1, ActiveOffice for Office 95 & 97, Adobe Illustrator TryOut 8.0, AniMagic 1.06b, Anvil Studio 1998 10, AviCreator, COWON Jet-PhotoShell 1.2, plus 12 other useful downloads

PROGRAMMING AND WEB EDITING

Applet Button Factory 3.0, Applet Headline Factory 2.0, BBEdit 4.5, BBEdit Lite 4.1, CoffeeCup StyleSheet Maker++ 3.0, CSE HTML Validator 3.01, ED 3.80t, 1st Java Navigator 3.5, HEXpert 3.0.21, as well as 15 other tools

SYSTEM TOOLS

AllClear 2000 Pro 2.7, APK Boot TweakUI 7.0, CpuIdle 5.0c, DirectX 6.0, Enlightenment DR .140, FAT32 for Windows NT 4.0, Intel Power Monitor 3.1, MasterBooter 2.6, NovaDisk 6.01 for Windows 95, Performance '95, PowerStrip 2.28, RegSnap 2.5, SafetyScan 2.5f, Spin 6.0, Sync 1.0, Update AnyWare

UTILITIES

Absolute Security 2.5, AcceleratedCD (for Windows 95), AcceleratedCD (for Windows NT), DirSize 3.2, LaunchPad Event Scheduler 2.87, PACT 12Ghosts 98.10b, Scratch Pad 2.21, ScreenLock 2.3, ShutDown NOW 3.5, SmartWord 1.0, StartEd 3.65, ViruSafe 8 for Windows 95, Waste Wacker 3.11, WinRAR 2.05, WinRescue 98 3.02



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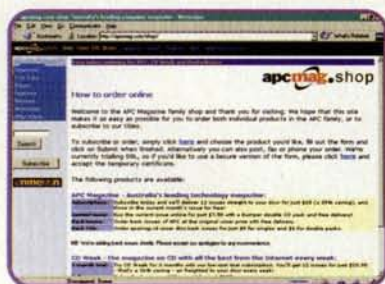
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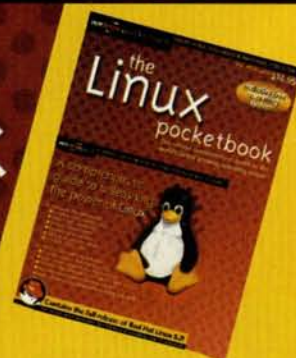
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● **APC Awards.** We look at the products and trends that caught our eye in 1998. And amid the hand-clapping and back-slapping, we'll pause to reflect on those that weren't so hot: the dogs of 1998.

● **Reviews:** APC Labs tests and evaluates seven 300MHz notebooks, and we compare commercially available PIMs (personal information managers) with their shareware counterparts.

● **New media gurus.** Dan Tebbutt and Simon Vandore single out the 10 most important people who are transforming new media from vague theory to pragmatic reality.

● **Bionics:** The cyborg — or cybernetic organism — is a powerful pop culture image. Next month we look at how a cyborg would work, and discuss the technical challenges separating fantasy from reality.

Plus: A controversial look at the biotech revolution, holiday games reviews, interactive Christmas presents and more.

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UNHAPPY PEOPLE

New report highlights Internet woes

The first annual Telecommunications Industry Ombudsman (TIO) report to incorporate Internet service provider (ISP) complaint figures has revealed widespread dissatisfaction among ISP users.

The TIO's 1997/98 annual report reveals a total of 1,736 "issues" lodged against ISPs in the past year.

The most common gripe with ISPs related to billing problems, such as charges for failed connects and unauthorised credit card debiting. Access, in particular congestion and slow download speeds, was another source of complaints. Over 60 people were unhappy with misleading information in their 'contracts' (also known as 'user agreements'), and a dozen users protested about privacy issues. This included having ISPs call their place of work to discuss alleged debts with colleagues.

Of the 1,726 issues raised against ISPs, the TIO could not investigate 422. Com-

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NEW PLAYERS

Online music wars begin

Australian consumers can look forward to a Christmas marketing war over the sale of CDs online, as an increasing number of players compete for the attention of music buyers.

OzEmail has announced a major expansion of its online CD sales operation, CMM. CMM was launched in April to sell music in Liquid Audio format online, but is now being expanded to sell conventional CDs. The store claims a range of more than 230,000 titles, sourced from a US distributor. To attract an international audience, prices are in both US and Australian dollars.

The move by OzEmail came in the same week that leading US online CD store CDnow launched an aggressive marketing push into the Australian market. CDnow president and founder Jason Olim said the company will concentrate on online and mass media marketing to introduce the US virtual store to local music buyers.

CDnow president and founder Jason Olim said the company will concentrate on



online and mass media marketing to introduce the US virtual store to local music buyers. "The Australian market is an important one for us. With the relaxation of [parallel importing] laws, we can ship product freely to Australia."

Olim said Australia currently accounts for "a single digit percentage of sales", but that does not mean it is insignificant. "CDnow began as a US-only service and we started it without thinking that it was a global business," he said. "We now sell a quar-

ter of our product overseas. We've made a strong effort to reach out internationally."

CDnow has not completely ruled out the creation of a local distribution centre. Olim said the Asian and Australian markets could possibly be considered for future CDnow activities, but added, "I can't say too much without revealing information to our competitors".

As a result of the weak Australian dollar and postage

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Report highlights Internet woes

Continued from page 21

plaints can only be investigated if the ISP is a member of the TIO scheme.

Ombudsman John Pincock said complaints by "customers of ISPs who have neglected or refused to join the TIO cannot be investigated and have been a source of frustration to consumers and the TIO".

ISPs came under the jurisdiction of the TIO scheme from July 1997, when legislation was introduced to make it compulsory for all ISPs to join. Consequently, the TIO's membership climbed from 19 to 535 within the space of 12 months. ISPs now account for the majority of TIO members.

According to the report, less than one-third of ISP members have had a complaint lodged against them, and ISP complaints make up just over 3% of the TIO's total case load.

It does not cost ISPs to join the TIO scheme, but any member ISP is liable for a fee if a complaint is raised against it. As the complaint escalates, the ISP must pay a higher amount.

Complaints

Some ISPs have complained about being forced to join the TIO. In early October, the Australian Communications Authority (ACA) issued a direction to one of Australia's longest-running ISPs, Healey Communications, forcing it to join the scheme.

Esther Alter, a spokesperson for the ACA, said several letters were sent to the provider to no avail. "Healey Communications indicated it would not join the TIO scheme until the ACA had issued a direction to do so."

"Mr Healey felt the TIO funding arrangement was disadvantageous to small providers and that ISPs shouldn't be governed," added Alter. "But whether an ISP feels strongly about it or

not, the government made a law and ISPs must comply."

However, the TIO can only follow up a complaint if the ISP has joined the TIO scheme. "The problem with ISPs that don't join, is that its members continue to be denied consumer protection," said Alter.

Antony Healey, owner and technical director of the ISP, said the ACA had "no right" to name him personally, as well as the company, in a widely available press release which threatened a \$50,000 fine.

"As far I'm concerned, I was simply following procedures in asking the ACA to issue me with a formal direction to join the TIO scheme. Once the direction was issued, I signed up within half an hour," he said.

Healey said that while he believed a complaints body in the form of the TIO scheme was good for the industry, he did not join voluntarily but under duress.

"It was a matter of principle," he said. "The TIO was once responsible for three telecommunications carriers and all of a sudden it has hundreds of ISPs under its jurisdiction. However, the fee structure did not change, and all ISPs — even backyard hobbyists — were expected to fork out lots of money for every case brought against it."

He added that this almost amounted to writing a "blank cheque" for an organisation whose staff was not even able to adequately address complaints. "At the moment, anyone can call up and complain about an ISP. I have a lack of faith in the abilities of the staff to recognise legitimate complaints."

Healey said he "wasn't too thrilled" at being singled out by the ACA; his main concern was that business contracts currently under negotiation would be affected.

Roulla Yiacoumi

Online music wars begin

Continued from page 21

costs, industry analysts have questioned the profitability of CDnow's move into the local market. But Olim is confident that price isn't the be-all and end-all to buying online.

"We stock five to 10 times the amount of titles that the largest music stores in Australia stock. We offer choice, we can offer it sooner and we are price competitive. In fact, in the [US], we are cheaper than many of the traditional retailers because while they discount some titles, we discount just about everything." While that policy has given CDnow solid market share, it has come at the cost of profitability. Shortly after launching the

"We just don't have that kind of money to spend on something we aren't getting a return from. We were the first Australian CD business online, but we jumped in a little prematurely."



Another unanswered question concerns collecting taxes such as the GST for online CD sales. IT minister Senator Richard Alston told APC that this was not an area that, at

"Internet trading is expensive to set up as well as maintain, and we just weren't seeing a return on our investment."

Australian marketing scheme, the firm announced plans to merge with another major online music seller, N2K, creating a company valued at around \$US250 million.

Other stores are also not convinced of the virtues of the Net model. Australian CD retailer JB Hi-Fi has pulled out of Telstra's SureLink online store, dumping its online trading business.

"It was simply commercially unviable," said Gareth Johnson, operations manager at JB Hi-Fi. "Internet trading is expensive to set up as well as maintain, and we just weren't seeing a return on our investment," he said

this stage, the Government will be regulating.

At present, if music is downloaded and a CD is not bought as a result, it is viewed as a legitimate use of technology and it is not taxed, said Alston. If things change and people start to download music to avoid paying taxes on CDs, it would be a different matter, he said.

State governments might want to take measures to protect their revenues. Alston noted that it was not just a state matter and consequently the Federal Government would keep an eye on the situation.

**Angus Kidman,
Roulla Yiacoumi and
Selina Mitchell**

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ENTERPRISE TOOLS

Java's new life

Java has yet to take off as a means of developing productivity tools such as office suites, but Sun's cross-platform language is winning more converts in the enterprise management and development applications arena.

Last month, Inprise launched Version 2 of AppCenter, its applications management tool for CORBA. Developed by Inprise's Sydney R&D facility, AppCenter is being touted as a key element in the company's forthcoming applications server, and has been written entirely in Java.

Next year, the company plans to release a 100% Java version of its JBuilder Java development tool. The current version is largely written in Java, with the exception of the program's editor, which was developed in C++, because of performance problems with Java.

Java is also valued as a key tool by ERP (enterprise resource planning) developers such as IBS, and is likely to become more important when Java-based frameworks such as San Francisco are rolled out. Java is also crucial to accounting software firms such as ACCPAC.

Success in enterprise applications has yet to translate to general office desktop tools, reflecting the less diver-

sified range of platforms in use. Plans to use Java to develop cross-platform suite applications have generally stalled, a problem Sun admits has been partly due to difficulties in cross-platform development. Rumours of a Microsoft-sanctioned Java version of Office proved to be wishful thinking; and Corel's Java version of its WordPerfect suite never passed beta stage.

Corel's move away from Java was underscored last month when the company announced it was licensing Visual Basic for Applications for use in future versions of the suite. Of the three major PC suite players, only Lotus has successfully released a Java-based suite. But Lotus eSuite is aimed at thin client computing rather than the more general PC market, despite some recent developments aimed at Wintel boxes.

Some other mass-market applications continue to be developed using Java. Netscape has put plans for a 100% pure Java version of Communicator on hold, but the opening up of the program's source code under the company's Mozilla program has allowed a team of freelance developers to continue the project under the name Jazilla.

Angus Kidman

FOCUS NEEDED

No more NT: Now it's Windows 2000

Ending weeks of speculation, Microsoft announced last month that its business OS Windows NT will be renamed Windows 2000 when Version 5.0 is released.

The naming scheme — which echoes that of the consumer-oriented Windows 95 and 98 products — will be extended across four key products: Windows 2000 Professional (formerly NT 5.0 Workstation), Windows 2000 Server (formerly NT 5.0 Server), Windows 2000 Advanced Server (formerly NT 5.0 Server Enterprise Edition) and Windows 2000 Datacenter Server. The latter, a newly announced product, seems to be designed to compete with the flood of high-performance 64-bit Unix systems being released on the market.

Microsoft still hasn't confirmed a release date for Windows 2000. Its official announcement said it is due sometime in 1999, but recent delays in beta releases have led many analysts to speculate that the product won't be widely available until 2000.

Regardless of the name, analysts advised against purchasing the product immediately after its release. Gartner Group analysts suggested waiting until the first service pack was released before considering purchasing the product, which they said would probably be released even later than Microsoft's recent forecast.

This involves 30 million lines of new code — a major potential source of problems — and the beta testing so far has been very negative, said Bruce McCabe,

research director at Gartner, who was speaking at the company's Symposium/ITxpo 98 in Brisbane.

Bob Hayward, group vice-president of Gartner Research, predicted that there would not be serious adoption of the operating system until 2001 or 2002. He added it was likely that although 80% of business users will stick with "fat" client PC architecture, less than 20% will migrate to NT 5.x/Windows 2000.

Angus Kidman and
Selina Mitchell



News Roundup

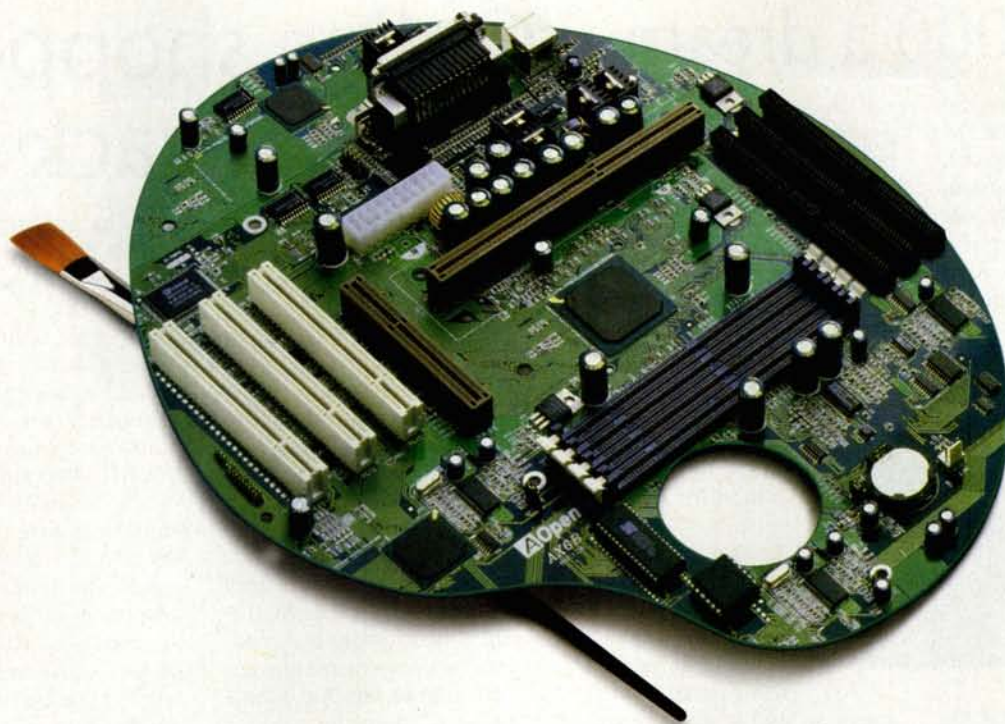
• The Victorian government's online payment and information network, maxi, is now processing over 17,000 transactions and 3,000 inquiries per month — 40% of which take place outside traditional business hours. The Victorian Minister for Information Technology and Multimedia, Alan Stockdale, said the service has been a success, with the number of monthly transactions easily exceed-

ing the 8,000 target. Additional government services will be added to maxi during the next few years, and the government is still committed to putting all its services online by 2001, he added.

• It doesn't look like trained IT staff will be queuing up at the dole office any time soon. The quarterly Morgan & Banks Job Index found that 52.3% of organisations expect to increase employment opportunities in the IT sector over the next quarter. In some regions of Australia, demand will

be even higher. In the ACT, for instance, 67.6% of organisations plan to put on more IT staff. Ian James, head of IT recruitment at Morgan & Banks, said a lack of qualified staff meant that hiring would remain a priority for most firms. "Jobs are being filled, but not at the rate people would like."

• AOL says it is still grateful for the work of its 5,000 beta testers, despite having cut back their reward of two months' unlimited free access to the service.



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NO DICE DOWN UNDER

Sub-\$2,000 a dream

In the US market, the sub-\$2,000 PC is virtually a standard, and an increasing number of vendors are attempting to produce complete systems for under \$1,000. Australia, though, is continuing to lag behind this trend, and equivalent systems typically cost between two and three times that amount.

In one recent example, Compaq has continued its aggressive push into the US consumer market by releasing an entry-level PC costing just \$US699; but the cut-down Australian version will set you back \$1,999.

The Presario 2266 features a Cyrix M II-300 processor with 64M of RAM, a 4G hard drive and 56K modem. Its Australian equivalent, the Presario 2262, features the same processor and modem, but only 32M of RAM and a 2.1G hard drive.

Compaq Australia consumer business manager Rob Balmer defended the Australian package, saying in Australia the machine is bundled with a Lexmark printer, Internet keyboard and Aureal sound system. However, the US version also ships with the same keyboard and sound system.

"This is a brand-name PC

selling at a competitive price," Balmer said. "The prevalence of the clone PC in Australia is very high, with clone vendors dominating the sub-\$2,000 market. This is an area we are now targeting very aggressively."

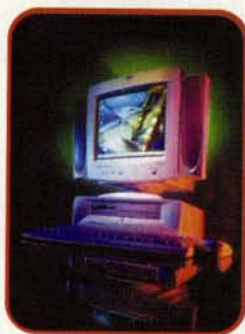
When asked whether it is harder to sell a machine with a non-Intel processor, Balmer said this isn't important to most buyers. "We are finding it's a minimal issue. Most people want price for performance and if we can achieve that with [a Cyrix] M II

processor, that is what we will ship with."

Balmer said it was psychologically very important to get PCs under the \$US1,000 mark, and he wouldn't be surprised to see "stripped down" machines selling for \$999 in Australia within the next year. However, this would depend on a number of variables.

"There are lots of figures we need to factor into the price of an Australian PC relative to its US counterpart, including sales tax, freight, transportation and local market conditions. Also, we need to consider the margins for retailers which are considerably higher in Australia," Balmer said.

Roulla Yiacoumi



PRIVACY, SECURITY CONCERNS

Online shoppers holding back

A new study has shown that price — not security concerns — is the main reason potential buyers have steered clear of making purchases over the Net.

Jupiter Communications' group director of data research, Evan Cohen, said aggressive pricing on selected items is the next "crucial step" in winning the online customer. "Vendors shouldn't slash their prices across the board, but strategic discounting will help commerce players convert non-buyers into online purchasers."

The study, 'Defining the Internet shopper: Attitudes, Objectives and Behaviour', conducted by new media research firm Jupiter and market research company NFO Interactive, surveyed 50,000 online and offline households.

It found 35% of the online population had indulged in online splurges in the last year. The remaining 65% of this group, which were described as "browsers" and "non-shoppers", were less likely to make a purchase soon, citing price as the rea-

son. The majority stated that greater discounts for buying online would spark "buying behaviour".

In other online news, the Labor Council of NSW has called for new laws to protect the privacy of workers who use email. According to Labor Council secretary Michael Costa, a small number of employers have abused workers' rights by intercepting personal email messages and telephone conversations.

Costa said workers should be guaranteed complete privacy for social interaction, which has now come to include email messages.

"We find it totally unacceptable for workers' phones to be tapped, so why should the same be done with email?" he said.

Costa said a recommendation has been made to the NSW Attorney-General to implement a code of conduct to protect the privacy of email users. He said he was confident of a positive response, because other laws relating to video privacy in the workplace had been implemented in the past.

Roulla Yiacoumi and William Maher



News Roundup



Company spokesperson David Packman said that the free membership offer still exists, but the hours have been limited to the off-peak period between 1am and 3pm. Beta testers also have the option of a 12-month plan which includes three hours of access a month for \$9.95, with a \$4 charge for additional hours.

Ⓜ Delays in antitrust trials must be catch-

ing. The Microsoft/DOJ stoush finally got under way last month after an interminable series of deferments, but the first full court appearance in the antitrust case brought against Intel by the Federal Trade Commission has been delayed again. The two parties — originally due to face off in early January — have agreed to shift the court date to February 23, 1999.

Ⓜ A copyright dispute between stock photography supplier The Photo Library and Melbourne-based travel book publisher

Waiviata has ended in a \$55,000 out-of-court settlement. The Photo Library alleges Waiviata posted 34 of its photographs online without its express permission. Company representatives indicated the licence granted to Waiviata was a limited agreement allowing for book-form reproduction of the images.

For complete versions of these and many other stories, be sure to check into <http://newswire.com.au>.



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PROJECTS APLENTY

Telstra's new network game

In a busy month for the national carrier, Telstra has outlined its plans to replace the existing analog phone network and has begun testing of a new 'ISP-free' email service.

As expected, Telstra announced last month that it would use second-generation CDMA (code-division multiple access) technology to build its second digital mobile telephony network across Australia. This network will eventually completely replace the analog network that rural and regional users have been fighting to keep in operation.

"For more than 1.5 million users currently connected to the analog network, the CDMA network will combine the benefits of digital operation with coverage similar to analog for handheld customers," said Telstra's group

managing director of products and marketing, Lindsay Yelland. However, the metropolitan network will be set up first.

In other news, Telstra began trials of a new service designed to provide access to email without using an ISP, in November. Tasmanians will be the first to have access to Telstra's 'easymail' email service. The service allows people with a computer and modem to send and receive up to 10 25K emails for the cost of a local call.

A national rollout which will coincide with Christmas is planned. Telstra also plans to extend easymail availability to fixed and mobile telephone handsets, as well as public telephone booths, although no date or firm plans have been made.

**Selina Mitchell and
Josh Gliddon**

Warped vision?

Telstra has dismissed suggestions that its new broadband games network, Wireplay Warp, charges for services which are already available free to customers of Big Pond Cable.

The new network, which began operation on November 1, will offer Big Pond Cable users their own exclusive games network. The sticking point for Telstra is that Big Pond Cable customers are already able to set up their own private multiplayer games on the internal Telstra network. By promoting an individual IP address to other players, cable users can use their own computer as a games server. There is no charge for this internal traffic on Big Pond Cable, whereas Wireplay Warp charges \$10 a month.

But according to Telstra officials, there is no guarantee that internal traffic on Big Pond Cable will remain free. "The only commitment Telstra has made is that it will not charge until the end of the calendar year. This doesn't mean we will charge, it is purely a business decision," Telstra manager of broadband services Nicole Sheffield told **NewsWire**.

William Maher

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Why can't you find Australia's top-selling magazines online?

Magazines: The missing link

Traditionally, Aussies are supposed to love their footy, enjoy their meat pies and be rather fond of Holden cars. We are also said to be voracious magazine consumers, although accurate consumption figures are difficult to ascertain.

Anecdotal evidence places Australians in the top five of magazine consumers internationally, but neither the Australian Bureau of Statistics (ABS) nor the Audit Bureau of Circulations (ABC) have the data to back this up.

Technology seems to push our buttons as well: over a third of the population has a mobile phone and four million have access to a personal computer. But what about the Internet? Most Australians, it would seem, just aren't interested — they perceive the Net as being too expensive and too difficult. The ABS found only 7.5% of these four million computer users regularly access the Internet, and 5% — or 200,000 — use email! This is pretty small beer considering the attention the Internet gets in the mainstream and specialist media, but it helps to explain why so few of Australia's major magazines have an online presence.

The ABC is responsible for verifying the number of copies Australian magazines sell every month. The *Australian Women's Weekly* is the number one title on the list, selling an average of 862,322 copies every month. Even a relatively staid title such as *Reader's Digest* shifts an average of 500,131 copies per issue.

To put this in perspective, *APC*, Australia's top selling technology magazine, averages 65,818 copies sold per month, which places it at number 38 on the ABC's top 50 list. (All figures are for Australian sales only.)

Readership figures, which show how many people really read a magazine in the waiting rooms of doctors' surgeries, or pass the magazine on to relatives and so forth, are somewhat larger. Figures for the *Weekly* show that a copy passes through over three million people's hands at some time during the month. Just as impressive is the weekly *Woman's Day*, whose reader-



ship averages 2,854,524 copies a month. (Both titles are published by Australian Consolidated Press, which publishes *APC*.)

Success in print doesn't necessarily translate into a massive online presence, however. Only two of the top 10 selling magazines are represented online — *Who Weekly* and *Reader's Digest*. *Who Weekly* barely qualifies since its site is nothing more than a rebranded version of US *People* magazine's site, and shares the same domain at Time Warner's Pathfinder.com.

Jo Roper, *Reader's Digest Australia's* PR director, said its site is intended "to add value for our customers", allowing them to make orders for other *Reader's Digest* products. "It also picks out some of the highlights from the monthly magazine, and gives people who aren't *Digest* customers a taste of the product."

Demographic data shows that only 30% of *Reader's Digest* readers have ever accessed the Internet, and less than 4% access the Net more than seven times a week. Between those extremes are the 16% that access the Net once a week, and the 10% going online somewhere between one and six times per week.

"It's a very considered business decision for us," said Roper. "The site cost less than \$40,000 to put up, and is very much a learning experience for us."

Demographics are also at the heart of the decision not to put *Australian Women's Weekly* and *Woman's Day* online, said PBL Online business development manager Kim Anderson.

"When to put up a site for an existing property is the most difficult decision," Anderson said. "You need to decide whether the [title's] demographic wants a Web site and whether they've got access or a connection to the Internet in the first place."

Demographic figures for the *Australian Women's Weekly* suggest that its readers are 6.5% less likely to have used the Net than the national average. "Only 20% of the *Weekly's* readers have ever accessed the Net," Anderson said. "Compare this to *Ralph* [which is number 46 on the top 50 list, selling 53,726 copies every month]; 50% of *Ralph* readers are already online."

Anderson suggests age and geographical location, and to a lesser extent, gender, are major influences on whether people go online. *Ralph's* readers are predominantly male, aged between 20 and 35 years old, and urban-based. *Women's Weekly* readers are female, often older, and not always living in urban areas. *Woman's Day* falls somewhere in between.

Pacific Publications publishes several top 10 magazines including *New Idea* (number three, 505,969 copies per week), *TV Week* (number six), *TV Hits* and *That's Life* (numbers nine and five respectively). Pacific representatives declined requests for interviews, as did Time Warner, publisher of *Who Weekly*. It seems fair to assume, though, that *New Idea* and *That's Life*, which share similar demographics to *Woman's Day*, would have similar reasons for not being online.

Anderson points out that it's important not to be ahead of the demographic curve when putting up magazine-based Web sites. "We are planning sites for *Women's Weekly* and *Woman's Day* next year, when it's anticipated that more of their readers will be online," she said. "It's also important to come up with original concepts — we don't want to simply replicate the magazine's content online."

Josh Gliddon

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IT gets a new emphasis in the post-election reshuffle, but big questions over outsourcing remain.

Canberra's new technology landscape

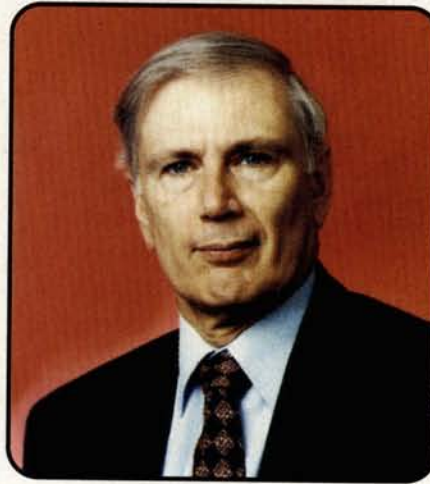
The Federal Government's refocus and rationalisation of responsibilities for IT policy in the wake of the election will see Senator Richard Alston take charge of many areas; but the changes appear to be causing a little confusion, especially in the area of outsourcing.

Alston, who in the previous ministry was responsible for Communications, the Information Economy and the Arts, is now the Minister for Communications, Information Technology and the Arts. Industry representatives see this as more than a name change, as the Government has said it will consolidate and amalgamate some of the responsibilities previously spread across five ministries. Organisations such as the Australian Computer Society (ACS), the Australian Information Industry Association (AIIA) and the Australian Electrical and Electronic Manufacturers' Association have been calling for a consolidation of IT responsibilities for years, as have many reports on the future of the Australian IT industry.

There will, however, still be other ministers involved in IT policy discussion, notably Minister of Finance and Administration John Fahey and Minister of Industry, Science and Resources Senator Nick Minchin. Industry representatives are taking a wait-and-see approach as to how this arrangement will work.

Under the new arrangements, Alston's portfolio has been expanded to include responsibility for national policy issues regarding the information economy, information technology and communications industry development, electronic commerce and business online, Y2K issues, government online delivery, and IT and communications management (excluding outsourcing, which remains with Fahey). Alston also takes over responsibility for the Office for Government Information Technology (OGIT), but he told APC he was not proposing any shake-up within the organisation, as he had not heard any criticism of its management. Post, telecommunications and the arts are also part of Alston's portfolio.

Few appear concerned that IT is still not the minister's only focus. "IT and Communications is really IT&T anyway, and the



two go together," said Australian Computer Society president Prins Ralston. As a senior minister, he added, Alston is more than capable of handling the arts portfolio as well, and his experience in the area means he already has a good grasp of the issues.

Labor has also given greater emphasis to IT. Long-time ACT politician Bob McMullan has been given the Industry and Technology portfolio in the shadow ministry and, as expected, ACT senator (and technology buff) Kate Lundy takes on IT responsibility as the assisting minister. Stephen Smith has become the Shadow Minister for Communications. Lundy is also the Shadow Minister for Sport and Youth Affairs.

Under the new structure, McMullan will handle wider technological policy and discussion, encompassing industry development, and Lundy will focus on issues such as Internet access and equity, encryption, ecommerce and the IT skills shortage.

Alston told APC one early area that needs to be addressed is the IT image problem. Children are much more interested in pursuing careers in law and commerce. To help alleviate the current skills shortage, they need to be made aware of the benefits of working in the IT industry, he said.

Alston noted that the money earned in IT fields was increasingly attractive, and that IT will continue to be an area of high jobs growth. "We will start to see more kids entering the industry, but that is not to say that there still won't be a problem," he said. As IT also offers opportunities for

travel, some skilled workers will continue to move overseas to fill the many vacancies that exist worldwide.

The biggest bone of contention appears to be that IT outsourcing remains a responsibility of Finance, rather than being integrated into IT policy. IT industry representatives have criticised this decision, but hope that the new arrangements will at least include close communications between the relevant ministers.

It is important to let the dust settle before analysing the full impact of the changes, said an AIIA spokesperson. However, he added, it is disappointing that the outsourcing responsibilities remain with the Department of Finance and Administration.

The ACS' Ralston said that while the society had expressed a view before the election that outsourcing should move over to the new portfolio, the ACS had been assured there would be close consultation between both departments and ministers. "We'll just have to see how this operates in real life," he said. "We are willing to wait and see."

One of the initial concerns raised when the outsourcing of IT was first discussed was that clustering of many departments and agencies could hinder rearrangements of Government administration. For instance, when the Australian Tax Office (ATO) tender closed in October, the post-election reshuffle meant some of the functions once within Customs (already tendered to EDS) were transferred to the ATO. Also, the Department for Family and Community Services will take over one chunk of the ATO business, child support. These changes will obviously impact on the size and workings of the services to be outsourced.

A spokesperson for Finance and Administration minister John Fahey said there would have to be some changes to outsourcing arrangements due to the alteration of government agencies. The spokesperson said Group 5 will create the most problems. The basic character of the group will remain the same, but discussions will take place over the next few weeks to iron out any problems, said the spokesperson. She added that contracts were highly flexible in order to deal with these sorts of situations.

Selina Mitchell

WHAT EXACTLY
IS IBM'S
POSITION
ON WINDOWS NT SERVERS?





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18TH FLOOR
OF A FORTUNE 500
COMPANY.

THE IBM NETFINITY 7000 SERIES. HIGH PERFORMANCE SERVERS FOR WINDOWS NT.

e-business means a lot of things. It means moving business to the Web. It means improving relationships with customers, suppliers and employees – boosting communication and efficiency both inside and outside an organisation. It means looking at data in new and meaningful ways.

e-business also means looking at PC networks in new and significant ways. And it's probably not much of a surprise to hear that Windows NT™ has become one of the popular new operating systems in the corporate world.

FACT

In 1997, use of the Windows NT Server operating system grew by 139% worldwide, reaching a 34% share of all server operating systems. (Source: IDC.)

What you may not know is that IBM is building Intel® based servers with the power to run the major business applications – from companies like SAP, Baan, JD Edwards, Oracle and QAD – used in the largest of corporate networks.

But it isn't power and reliability alone that distinguish Netfinity Servers from their would-be peers. It's that they come loaded with things like IBM Netfinity Manager – a comprehensive set of standards-based software tools designed to make it easier to manage and run your network.

It's that we work with industry leaders like Intel to bring new, more powerful technology to market – in servers designed to use it to its fullest.

The Netfinity 7000 M10 server, for example, is powered by the new Intel® Pentium®II Xeon™ processor 400MHz, providing it with some of the highest performance benchmarks in its class.

(Visit www.pc.ibm.com/us/techlink/srvperf for details.)

History, plain and simple, also separates Netfinity servers from all others. IBM has been building mission-critical systems for the corporate world for decades, and now we've applied that expertise to the world of Windows NT. Netfinity servers are the first to offer scalable parallel technology with a clustered system and hot-plug PCI Implementation. Netfinity servers also offer scalability features you don't usually expect in a server running Windows NT – like the ability to hot-swap hard drives, adapters, power supplies, and more – without taking your network down. Netfinity servers are also designed to be quick and easy to integrate into your existing IT infrastructure, whether it's powered by IBM or not.

Netfinity servers from IBM aren't just tools for big business, they're tools for big e-business.

IBM NETFINITY 7000 M10

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e-business tools

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The real explosion of Windows NT servers has been at the departmental level - starting with desktop computers and then connecting those desktops into larger networks, enterprise servers and legacy systems.

The growth of intranets, Web commerce and sophisticated custom apps built with powerful cross-platform software like Lotus® Domino™ has fueled the demand for powerful, reliable servers that connect thousands of PC users inside an organisation - from sales reps in the field armed with ThinkPads, to desktop users in customer service departments. Intel® based servers like the Netfinity 5500 Series.

FACT

A server is a repository of information, information that can quickly become powerful business intelligence when fully exploited. This is e-business. Knowing more about customers, what they need and want. Mining growth out of details. Uncovering new markets (and margins) from within.

All these people connected via Windows NT servers also need access to the detailed information that resides on the more powerful systems that are the core components of a major enterprise (like, say, an IBM RS6000 SP UNIX

server capable of processing millions of transactions a second). In such a world, the ability to quickly and seamlessly integrate departmental Windows NT servers into your larger IT infrastructure is critical.

Netfinity servers like the new Netfinity 5500 M10, help simplify this integration. Take for example, IBM Netfinity Manager software. It ships with every IBM Netfinity server. It's platform agnostic. It lets you manage clients and servers from dozens of leading manufacturers. It also helps you tie your Windows NT network into enterprise-wide management software such as Tivoli® Enterprise®, Microsoft® SMS™ and Intel LANDesk™.

This is what e-business is all about - not just building powerful servers for departmental use (and make no mistake, the Netfinity 5500 M10 can handle tasks from huge e-mail networks to 24/7 Web commerce), but also providing tools to integrate and manage those servers as part of a much larger network. This helps you control costs and keep your network up and running.

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IBM NETFINITY 5500 M10

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OF WETSUITS AND
A STACK OF
GUIDES TO BEING A
WEB ENTREPRENEUR.



*Estimated Street Price inclusive of sales tax. Individual Reseller Prices (and therefore leasing rates) may vary. Prices are quoted at 20/10/99, are subject to change and do not include delivery. Prices are for model 96801RU (Netfinity 3000 M10), 96811Y (Netfinity 3500 M10) and 94762CU (Netfinity 3000). Network operating system not included. MHz denotes microprocessor internal clock speed only; other factors may also affect application performance. 1.Easylease rates are available from IBM Australia Credit Limited ACN 002 955 571 through Authorised Easylease Agents. Easylease is for business customers only with a minimum transaction of \$2,000. Rates calculated on Estimated Street Price shown and do not include stamp duty. Rates are based on 36 monthly advance payments on a lease to return. Rates are subject to credit rating and may vary. 2.Conditions and lending criteria apply. IBM product names are trademarks of International Business Machines Corporation, Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation. Lotus, Notes and Domino Intranet Starter Pack are trademarks of Lotus Development Corporation. Intel, the Intel Inside and Pentium are registered trademarks and Pentium II Xeon is a trademark of Intel Corporation. Other company, product and service names may be trademarks or registered trademarks of others. © 1999 IBM Australia Limited. ACN 000 024 733. All rights reserved. SOMPC362

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FACT

Of course, the value, quality and reliability of the Netfinity 3000 server is such that a whole bunch of not-so-small businesses will choose these servers by the dozens for things like print spooling and file management. Not the most glamorous tasks, but the day-in, day-out, got-to-be-dependable side of what e-business tools have to do.

If you'd like to know more about the full range of IBM Netfinity servers, financing arrangements and server options from supplemental storage to fiber-optic connections—bookmark www.pc.ibm.com/au

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Apple Mac OS 8.5

Mac OS 8.5 is the last time the Mac OS will undergo a major upgrade before OS X, a fundamentally new Mac operating system, makes its debut sometime next year. OS X promises to bring true multithreading and multitasking, as well as a modern memory management regime to the Macintosh platform. OS 8.5 doesn't fundamentally improve the core operating system functions, although it does, as Windows 98 does for Windows, impart the appearance of modernity.

Clues to OS 8.5's window-dressing nature can be found in the emphasis that Apple puts on Sherlock in its promotional material. Sherlock is a search facility that brings together local, network and Internet searching into a single, useful utility. In addition to allowing local drive searches based on file content — as well as standard keyword, location and name criteria — Sherlock lets users perform natural language queries across multiple Internet search engines, aggregating results based on relevance. Additional search engines can be plugged into Sherlock, either by downloading the relevant module from a search site, or by the end user writing a custom module in HTML. Sherlock is compatible with both Netscape Navigator and IE (both ship with 8.5), although Navigator users will need to specify it as their default browser in the Internet control panel in order to avoid inconvenient IE moments, as it is the 'preferred' browser on the Mac.

Apple emphasises three other major improvements to OS 8.5. The first is native PowerPC AppleScript, the second is improved network copying times, and the third is the inclusion of QuickTime Pro. Native AppleScript will be genuinely useful for those who need to automate routine activities, although the primary advantage of its nativeness is speed, not functionality. Apple claims standard script routines will run up to five times faster than in previous versions.

AppleScript can be used to automate virtually any OS function, including actions associated with opening, closing or modifying folders, Sherlock searches, ColorSync operations and network calls.

Network copying under OS 8.5 is claimed to be 22 times faster than under Windows NT, although it is worth noting that the results were obtained using an OS 8.5 client copying to an Apple server running OS 8.1 and AppleShare IP 6. The NT results were from a Compaq 400MHz Pentium II running NT 4.0, copying to a Compaq 400MHz Pentium II running NT 4.0 server. Copying times in a heterogeneous environment — for example an OS 8.5 client and a NetWare server — may not be as speedy.

The OS has been given a facelift. Icons now have a sharper look and aliases sport a little arrow in the corner, à la Windows 95/98. The previous method for denoting aliases, using italicised script and tacking the word 'alias' onto the end of the filename, has also been retained. This is perhaps overkill, although the arrows are definitely a worthwhile improvement. A further improvement lets Internet addresses be converted to aliases and placed on the desktop or in a folder.

Scrollbars inherit dynamic resizing from the NextStep operating system, which was acquired by Apple when it bought NeXT. This resize function indicates how much of a file's contents are on display in a given window, but didn't appear to work in Office 98 for Macintosh documents. The scrollbars also allow faster navigation within a document, thanks to the addition of arrows at the bottom and right-hand side of the scroll column.

A further improvement is the detachable application bar, which operates similarly to the Windows taskbar, but adds the BeOS-like improvement of being positionable anywhere on the desktop and remaining open on top of a current application.

Apple recommends running OS 8.5 with a minimum of 16M of RAM and 24M of virtual memory; like all OS and software memory recommendations, this needs to be taken with a grain of salt. APC examined OS 8.5 on an iMac with 32M RAM running both IE and Navigator, as well as Office 98 for Macintosh. The iMac frequently ran out of memory when running either IE or Navigator and Word 98 concurrently, although the problem was less evident with Naviga-



tor than IE. Navigator's subjective performance was also superior to IE's when connected to Big Pond using the internal 56K modem. In light of this, APC would not recommend running OS 8.5 in conjunction with any major productivity applications with less than 64M RAM.

Sherlock is a worthwhile enhancement to the OS, as are the general look and feel improvements. Sherlock's search capabilities are difficult to fault, and free users from having to construct Boolean arguments when making complex searches. Apple should, however, consider placing Sherlock directly on the desktop rather than burying it at the bottom of the Apple menu. Likewise, the improvements to network performance should be a boon to those in Apple-only environments, but the performance in mixed environments remains to be seen.

Existing Mac users should definitely consider upgrading for look and feel reasons alone. Looked at objectively, however, OS X can't come soon enough for users reluctant to embrace BeOS in order to obtain a modern operating system.

Josh Gliddon

Apple Mac OS 8.5

■ Distributor	Apple Computer
■ Phone	1800 025 355
■ Online	http://www.apple.com.au/
■ Price	\$165
■ In short	A worthwhile upgrade for Mac users, but Apple's still treading water until OS X arrives.

*Do the two hottest PCI soundcards on the market
add much to your computing experience?*

Diamond Monster Sound MX300 & Creative Sound Blaster Live

If you thought graphics cards were changing fast, take a look at soundcards. We've just recently had state-of-the-art offerings from Creative and Diamond, only to be updated a couple of months later by even more powerful and spec-overloaded cards.

The first off the block was Creative with its Sound Blaster Live, which marked a new standard in four-channel sound capability. At \$499, the card is not cheap, but it carries an impressive list of options. The main feature is the first consumer implementation of what Creative has dubbed Environmental Audio (EA). This is a subset of the E-mu Systems soundstage software used for professional aural modelling. The idea is that games programmers will be able to use Environmental Audio extensions (EAX) to give a much greater spatial and imaging capacity to audio tracks. The card maximises these effects with the provision of discrete four-speaker output.

There is certainly plenty in the box: microphone, three separate CDs, the card itself, plus a separate digital I/O card that can handle S/PDIF digital interchange with devices like DAT decks, CD burners, MIDI keyboards or multichannel discrete amplifier decoders for semi-professional mix-downs. This extra card is connected by a bundled cable and takes up an extra external slot.

The PCI card itself has extensive connectivity. Internal connections are available for microphone, modem, telephone answering device, auxiliary input, CD-ROM, DVD MPEG decoder and S/PDIF-capable CD-ROM. That's in addition to the external line-in, line-out, microphone-in, joystick and two sets of speakers. Only one set of internal cables is supplied, however.

Installation was straightforward, with all drivers and accessories being loaded through the standard Windows hardware set-up process. The card uses system RAM to accommodate up to 256 voices, and an EMU10K1 engine provides the grunt. In use, the card offers a truly astonishing range of options and utilities, one of the most impressive being the location synthesiser. This takes any sound source and

adds ambience and reverb to simulate a range of locations and ambiances — such as underwater, in a bare room, in a stone corridor hall or even 'psychotic in a cupboard' — with remarkable realism when used in four-speaker mode.

Both MIDI and standard CD audio get a noticeable lift in quality from this card, especially when used with a set of four powered speakers. Supplied software includes Cakewalk, Sound Forge and the quirky Keytar guitar/keyboard creative agent. Live is a major step forward in soundcard capability, but the lynchpin is probably whether or not the games industry accepts EAX extensions. Either way, it's a fine audio tool.

Diamond's answer to Creative Live, the Monster Sound MX300, builds on the existing set of four-channel features introduced by the Monster MX200. The new card claims improved specs over the 200, but at a considerably reduced price. Like its predecessor, it uses the Aural A3D chip as its surround processor, but in Version 2.0 Vortex guise. This uses DirectX 5.0, 6.0 plus 3D as the base software extensions, avoiding the proprietary EAX inclusions required by the Creative card. However, Live has a broader range of options and technical output alternatives.

This accent on existing rather than newly developed technology is continued by the MX300's support for Dolby AC-3 (Digital Surround), as used in most DVD videos and home theatre setups. DVD MPEG decoding is handled by software, which means any DVD title using either surround encoding system should play acceptably through the one card. Although our test unit was a beta and came with limited software utilities, Diamond says the final units will also be shipped with MP3 encoding for use with Internet audio files.

Using the install utility rather than Windows' own, setup was not quite as slick as Creative's, but admittedly the software was still in beta. It also had nowhere near the number of connections of Live, with just standard in, out, four speaker and joystick ports on the backplate, plus three standard sockets for internal inputs



such as CD, auxiliary and modem.

The MX300's performance was excellent, demonstrating its spatial imaging ably on the likes of BattleZone and Aural's demos. In fact, on these games, the MX300 was slightly ahead in terms of head-turning aural stunts. Like Live, the card makes extensive use of the host machine's memory to accommodate its 320-voice capability, 256 of which are host-provided. The card makes excellent use of the new Aural chip's capability, and as such will probably be the choice for most gamers and DVD watchers. When it comes to out and out sound quality for the digital audio enthusiast, however, the Live card is still most likely to get the guernsey.

Jeremy Torr

Diamond Monster Sound

■ Distributor	Diamond Multimedia
■ Phone	(02) 9460 2356
■ Online	http://www.diamondmm.com.au/
■ Price	\$249
■ In short	Startlingly wide range of capabilities at a bargain price. Who needs a home theatre system?

Creative Sound Blaster Live

■ Distributor	Creative Pacific
■ Phone	(02) 9906 8887
■ Online	http://www.sblive.com/
■ Price	\$499 (\$299 without digital I/O card)
■ In short	Creative is still state-of-the-art in digital audio, but gamers may balk at the price.



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Easy to use. At the same time, LIDE allowed us to design a smaller, sleeker scanner with an exceptional combination of beginner and expert controls, and with easy to connect (daisy chain) parallel port connections for Windows® 95/98 and NT 4.0.

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FB 320P – \$229^{RRP} and FB 620P – \$299^{RRP}

Canon

Not a spectacular upgrade, but still a great home accounting package.

Intuit Quicken 7

When Quicken 6 hit the shelves, it was a major step forward from previous releases. It had a much revised interface, context-sensitive help, excellent graphing — the only thing missing was the promise of Internet banking, as signalled by Microsoft's Money 97. However, that was a long time ago in software terms — about a year — and things have changed since then. Microsoft has realised that online money management and banking requires more than a link to Barclays Bank in the UK, and the ability to print cheques. The reality of online transactions has been that major Australian banks haven't jumped at the opportunity to become Net-effective. They seem to have put most of their effort into phone banking, and as a result, both Money and Quicken have failed to produce the 'all your transactions from your home PC' scenario. This latest version of Quicken is more a spit-and-polish affair than a visit to the shoemakers. More gloss, more shine, but no major changes to the underlying substance.

One significant change, however, is that the user gets kicked straight into the set-up routine, instead of having to mess about with registration procedures before they can really get going. Registration is available later during setup, and can be done either over the Net or by phone. In our case, the Quicken site kept dropping out before we could download the registration code, so we resorted to the free phone call instead.

The system as a whole sets itself up very smoothly indeed, asking various questions about usage, your family and the kind of accounts you will use. All these help set up the user profile and options you are likely to use most. Intuit has kept the very useful first-time user cue cards and short video sequences that made Version 6 so easy to get up and running. They have left out the animated actors, however, and just used a kind of screen-cam system to show what happens and what goes where — a definite improvement in focus. The program also talks the user through many of the initial sequences, in time with the required actions. This is a very simple yet highly effective approach to contextual online help.

The new Online section, which enables

the user to log onto the Quicken Web page directly from inside the program without having to load up their regular browser, is another welcome improvement. This both saves time and keeps the interface clean as the QBrowser window is identical to all the other Register, Report, Charting and Account windows. Setting up for your existing ISP is well executed; alternatively you can dial in and sign up with the Quicken ISP if you don't already have one. All round, a solid and smooth implementation.

The Quicken Web site offers a few handy extras like loan calculators, mortgage options and a range of tables outlin-

ing is much more useful. If you want to stop repaying your home loan from one account and start paying it from another, you can simply move it, rather than deleting the original and setting up a new one in the second account.

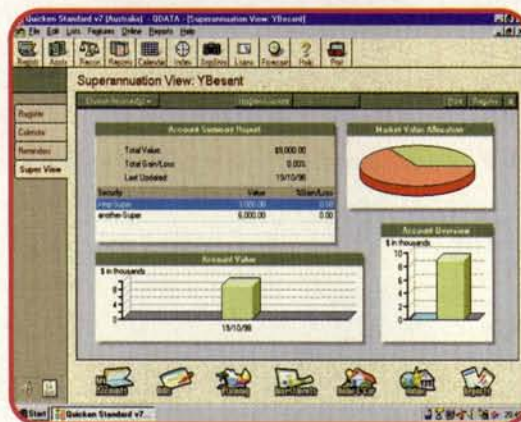
The other major addition is the ability to keep an eye on superannuation accounts. This enables you to track a whole range of super investments over time and to keep an eye on what they will return when you finally stop full-time work. Add to this the excellent graphing capability that Quicken already had — and the new ability to download share prices — and Quicken 7 can cater for almost all aspects of your financial affairs. All the usual cheque printing and reconciliation operations are still supported, with a few of the rough edges smoothed off, and with more room to enter text details so you don't have to remember as many of those annoying abbreviations. Existing users of Quicken can load and run existing files in Version 7, but once imported they can't be read in the older version, although a copy of the original is stored before the formatting changes are made.

Overall, the changes to this version, especially the standard version which doesn't include invoicing and inventory, don't really make it that much better a performer. If you already have Quicken 5 or 6, the differences don't really make buying this latest update worthwhile. If you have a version older than Quicken 5, or are new to money management software, however, this package is definitely worth a look. It's still one of the best home and small business money management packages around.

Jeremy Torr

ing credit cards and financial service providers and their wares, but not much more. In most cases, you can do just as well, and get a bigger picture, by surfing the Web yourself. Back inside the program, there are more tweaks to the interface with the addition of Easy Answers for simple reports. These remove the need to specify exact types of data when drawing up report criteria, using simple questions such as 'How much did I spend on...?'. Adding regular payments has also been simplified in the Calendar view. New payments or actions can simply be dragged and dropped, then specified within auto-pop-up dialog boxes. Again, not a major change, but a definite improvement in usability. One aspect touted on the box is the new Pay Cheque Wizard — but exactly what it does for whom is not really clear. It merely adds a regular income entry to the standard register, and sets up standard deductions from it.

The addition of transaction movement



Intuit Quicken 7

■ Distributor	Reckon
■ Phone	1800 658 086
■ Online	http://www.reckon.com.au/
■ Price	\$79.95
■ In short	No startling new facilities compared to Version 6, but still one of the best home money package around.

It is no mean feat to make Australia's most popular printer for home and small offices better than ever. But that's just what we've done with the new BJC™-255SP.

Use 75% less ink. Super Economy mode reduces ink consumption by 75% compared to Standard mode, and works for both black and white and colour. Combined with a high capacity, black ink cartridge, it can print up to 2400 pages in black and white, and up to 600 in colour using standard inks*. That's anywhere from two to five times the output of any direct competitor!

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Brilliant colour, super economy, optional PhotoRealism, improved Internet printing,
all for just \$199.

Optional PhotoRealism™ To this Canon adds the option of PhotoRealism inks, for photographic reproduction approaching silver halide quality. By layering inks in up to four densities, it produces up to four times the colour combinations of conventional CMY printers, for smoother colour gradations and more accurate colours in skin tones and other light shades.

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Canon Customer Care. All Canon printers feature a one-year warranty, upgradeable to three years for minimal cost, and are backed by Customer Care hot-line support. Drivers are available for Windows® 3.1x/95 and Windows NT.



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BJC-255SP colour Bubble Jet™ printer – \$199^{RRP}

Canon

* Based on 5% page coverage, Super Economy not available with PhotoRealism inks. Price shown is the recommended retail price including tax. Canon and the Canon logo are registered trademarks and BJC, Bubble Jet and PhotoRealism are trademarks of Canon Inc. Windows is a trademark of Microsoft Corp. in the U.S. and other countries. Canon Australia Pty Ltd ACN 005 002 951 CS/5263

Philips DSS370 USB speakers

USB (universal serial bus) holds the promise of universal connection by any peripheral, anywhere, with superfast speeds and built-in plug and play.

Philips has thrown its weight behind the initiative by making cameras, video-capture devices, LCDs and now USB speakers. Its first audio attempt is the DSS370 set, which offers powered speakers putting out 15W per enclosure, plus a 30W subwoofer, from a standard USB port. All these are real-life RMS ratings, so you can actually turn up the volume without the speakers sounding like a can full of ball bearings. In fact, the sound quality is as good as any dedicated system we have heard, with excellent soundstaging from the twin-driver reflex-vented cabinets, and truly desk-vibrating bass from the subwoofer. The controls include speaker-mounted volume, on/off, Dynamic Bass Boost and what Philips calls Incredible Surround buttons. The software drivers

add a software version of these controls to the System Tray.

To wire the system up, just plug the host speaker into the USB port, the other speaker and subwoofer into the host, then connect the power-supply cords. Running Windows 95 drivers as supplied on the CD caused a few glitches (CD audio wouldn't play, although MIDI and WAV files were fine).

Running under Windows 98 caused no such headaches. Selecting Multimedia in the Control Panel, then choosing Philips USB speakers from the list gave satisfying pings and tings from the word go. The real beauty is that you can run sound files and CD audio through the speakers with no soundcard in the host computer which is not only very smart, giving better fidelity, but less costly too. Our review implementation did have a couple of quirks, though. First was the slight glitching of sound when the mouse was moved or a new application opened, although it could have been the fault of

the host machine. The second concerned the Dynamic Bass Boost and Incredible Surround buttons, which seemed to do no more than light up a couple of LEDs.

Even so, this speaker setup has plenty to recommend it. It can even cope if you don't have a USB port, as it is fitted with a standard line-in socket and connector cable. Overall, an excellent product for those tired of low-quality sound.

Jeremy Torr

Philips DSS370 Speakers

Distributor	Philips
Phone	1800 658 086
Online	http://www.philips.com.au/
Price	\$279 speakers only; \$349 with subwoofer
In short	Well specified, excellent sound quality, flexible and aggressively priced.

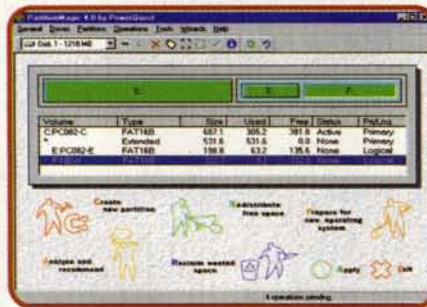
PowerQuest Partition Magic 4.0

Need to partition or format a new disk, or repartition an existing disk? Partition Magic 4 (PM4) is the answer. It builds on the success of previous versions with improved ease of use, new features, and enhanced functionality.

PM4 is a great way to partition a new drive, or to create, resize and move partitions. It does this more quickly and safely than the combination of FDISK and FORMAT. PM4 also converts FAT16 partitions to FAT32, NTFS or HPFS, and can convert FAT32 partitions to FAT16 (unlike Windows 98, in which the conversion is a one-way trip). For people interested in Linux partitions, Version 4 supports the ext2 file system.

Unlike FDISK, PM4 repartitions drives without erasing files, though it's always a good idea to back up the system first, to protect against mishaps such as power failure halfway through a conversion. One of the great new features is the native-mode executables that run within Windows (95, 98 or NT) or OS/2, in addition to the character mode and graphical DOS modes of previous versions. Other new features include wizards, batch mode, and some very useful utilities, including a boot manager.

The wizards automate common tasks, including analysing partitions on the sys-



tem and recommending changes to improve use of space, creating a new partition, reclaiming wasted space, redistributing free space across logical drives, and preparing for a new operating system.

PM4's batch mode can set up a group of tasks, allowing the user to quickly specify a sequence of actions which then run in sequence without further intervention. Previously, each task had to finish before the user could specify the next task.

The three bundled utilities are Magic-Mover, DriveMapper and BootMagic.

When partitions are added or deleted, drive letters often change and programs may not work properly, if at all. DriveMapper is used to change drive letter references in configuration files and the registry so that programs can find the

right files and run correctly. At other times, you may want to move a program from one drive or directory to another. MagicMover takes care of this task. First it moves the files, then it changes all relevant drive letter references.

The final utility is BootMagic. The combination of Partition Magic and BootMagic allows installation of two or more operating systems. Then, when the system boots, the desired operating system is selected from a BootMagic menu. While BootMagic is quite effective, it is no match for System Commander, the leading boot manager program.

John Hepworth

PowerQuest Partition Magic 4

Distributor	Checkmark Technologies
Phone	(02) 9957 6970
Online	http://www.powerquest.com/
Price	\$129.95 (single system); upgrade, multiple system and technician licences available.
In short	Definitely a utility worth getting.

Better colour, Super Economy, fast blacks, PhotoRealism and optional scanner,
the BJC-4310SP does it all.



It can cut ink consumption by 75%, be used as a scanner, improve printed images down-loaded from the Internet, or even print banners. And this is in addition to better colour for plain paper, PhotoRealism inks for the gold standard in photo quality printing, plus super fast B&W!

Better operating economy. Super Economy mode reduces ink consumption by 75% compared to Standard mode, and works in both black and white and colour. It can print up to 3600 pages in black and white, and up to 400 in colour!

Better on plain paper. Another feature is Canon's Drop Modulation Technology with dual drop sizes for smoother colour gradations. It is designed to produce better looking colour on plain paper, which also helps keep operating costs down.

The PhotoRealism gold standard. When quality is most important, there is the option of Canon PhotoRealism inks. They vary

the saturation per pixel so that a single dot could have 0%, 33%, 67% or 100%. This produces up to five times as many colour combinations as conventional CMYK inks, with better half-tones and almost no visible grain, even in areas of low colour density.

Super Economy in colour and B&W

High speed blacks. A high-speed black ink cartridge with 128 print nozzles is included with your purchase. It is capable of speeds up to 510 characters per second (4.5PPM)²

It's even a scanner. The optional IS-22 scan head allows you to turn your printer into a colour scanner in seconds. It scans colour images up to 360 dpi and offers high speed B&W scanning for fax, OCR and copying functions³

Canon Customer Care. All Canon printers feature a one-year warranty, upgradeable to three years for minimal cost, and are backed by unlimited hot-line support.

The BJC™-4310SP. Everything you could ask for in a printer, and a little more. For more information call us on 1800 021 167.



BJC-4310SP colour Bubble Jet™ printer – \$299^{RRP}

Canon

Price shown is the recommended retail price including tax. Canon Australia Pty Ltd ACN 005 002 951. Canon and the Canon logo are registered trademarks and BJC, Bubble Jet, Drop Modulation Technology and PhotoRealism are trademarks of Canon Inc. All other trademarks are the property of their respective owners. 1. Output by cartridge may vary based on operating conditions. Super Economy page numbers are based on BC-20 black cartridge with 7.5% coverage and BC-21c colour cartridge with 5% coverage. Super Economy function not available with PhotoRealism inks. 2. Print speeds measured under DOS environment. 3. Fax, copy and OCR functions require user supplied software. Canon reserves the right to change specifications without notice.

8/98 CS5365

Imation SuperDisk for iMac

It's novel appearance and lack of removable storage are the Apple iMac's most controversial features. Apple's justification was that the Internet and email made the floppy drive redundant; it also indicated there would be numerous partners lining up to offer USB solutions for anyone really needing removable storage.

Imation is first off the rank with its colour-matched 120M capacity LS-120 SuperDisk. Imation sales have trailed Iomega's Zip in the floppy replacement market, despite it offering read-write compatibility with standard 1.44M floppy disks. Iomega's advantage has possibly arisen because the majority of Zip users already have a 1.44M drive as part of their system.

Connecting the SuperDisk to the iMac is a snap, simply requiring the installation of a USB driver and the connection of power and a USB cable. Outlined in simple pictures printed inside the driver's CD-ROM sleeve, it probably takes less than three minutes including restarting the

computer. Although many Windows users would be interested in a USB LS-120 drive, no Windows drivers are available for the device.

New users or those unfamiliar with USB may be confused upon restart, as there's no indication that anything has been installed. The only way to verify that the device is present is to put a disk into the drive and wait five seconds or so for its image to appear on the desktop. In fairness, there's very little that even the most naive new user could get wrong, except forgetting to plug it into the wall.

The SuperDisk's performance, particularly reading or writing to 1.44M floppies, is fairly tardy. APC's informal tests found transferring 1.2M of Mac files to the hard drive took around two minutes; moving PC files was a coffee-making operation not helped by the 32M-equipped test machine running out of memory while also running Navigator and Word. Reading and writing to the LS-120 disk, a similar 1.2M file transfer took around 15 seconds.

The only real problem with SuperDisk — and this is also true for Zip — is that they're not universal. The destination machine also needs to have a SuperDisk or a Zip drive, otherwise the files are useless. In this sense, Apple's probably right when it sneers at the utility of removable formats in the face of the Web's growing ubiquity. Imation's great for transferring really big files, or for moving old ones from floppy to hard drive, but it won't usurp the universality of the floppy any time soon.

Josh Gliddon

Imation SuperDisk for iMac

■ Distributor	Imation
■ Phone	1800 225 013
■ Online	http://www.imation.com/
■ Price	\$379
■ In short	Great for backward compatibility and large file transfer; otherwise stick to email.

Corel WordPerfect 8 for Linux

For many Linux users, vi or Emacs represent the perfection of WYSIWYG word processing — what you see is ASCII text, what you get is ASCII text. For the rest of the world's computer users, however, there is Corel's WordPerfect 8 for Linux.

Writing documents in WordPerfect 8 is, unsurprisingly, much like writing documents in any other modern word processor. For Corel, which is marketing Linux-based network computers in the US

Corel has been producing WordPerfect for the Linux platform for some time now. The application has a polished look and feel, and is highly configurable. Users of Microsoft Office and other similar programs should have no trouble adapting, as the application looks and acts almost identically to its Windows counterparts. Most of the keyboard shortcuts are consistent across platforms, and placement and operation of toolbars is almost identical as well. A large selection of graphics (clip art, photos and textures) is also supplied.

But WordPerfect 8 is not yet the panacea of Linux Office suites. Where it is lacking is in the spreadsheet department. Instead of offering a fully functional, standalone application, WordPerfect 8 ships with a smaller, more compact charting tool. Featuring a split-pane view, the charting applet includes a spreadsheet in the top pane for entering information, and a preview window in the bottom pane. After finalising the settings, you can import the chart back into WordPerfect. For most users, however, the charting tool should prove to be adequate.

Where WordPerfect does shine, however, is in the area of file format conversion. Included in the list of supported file

formats are various flavours of Ami Pro, WordPerfect, Lotus 1-2-3 and Microsoft Office.

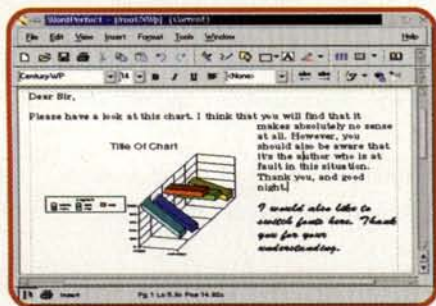
While the lack of a separate spreadsheet program prevented WordPerfect from reading Excel files, it managed to handle a Word 7.0 document with an embedded Excel spreadsheet remarkably well. WordPerfect also includes support for importing and exporting documents to and from HTML.

Perhaps the most significant praise of WordPerfect for Linux is that it is on par with the word processors found on other operating systems, which is evidence of Corel's commitment to Linux.

Travis Simon

Corel WordPerfect 8 for Linux

■ Distributor	Corel
■ Phone	1800 658 850
■ Online	http://www.corel.com.au/
■ Price	\$169
■ In short	WordPerfect 8 for Linux is a high-quality word processor, though lacking in other areas.



(called NetWinders), this sort of base functionality is essential to make Linux a viable desktop operating system. And for existing and would-be Linux users, it is simply the icing on the cake.



Canon BJC-80
\$399^{RRP}



Canon BJC-50
\$699^{RRP}

Advanced colour, cable-less communications, optional scanner plus two sizes that are

Small and smaller!

Canon has a wonderfully new idea for people that need a portable printer. A choice.

On the small side there is the BJC™-80. It is a fraction of the size of a briefcase. Yet, with its in-built sheet feeder and power adaptor included as standard, it is designed for people who have to produce high volume output from a very small printer.

Drop Modulation Technology.

Conversely, if size is critical, there is the brand new BJC-50 with in-built battery. It's not just small, at approximately half the size of the BJC-80 it's absolutely tiny.

Equally impressive, their performance is as big as their size is small.

Using Canon's advanced Drop Modulation Technology™ you can print everything from colour charts, to high quality photographs. Or, in seconds you can convert to extra high-speed black and white for finished business documents using the dedicated black cartridge with 128 print nozzles!



The BJC-80 fits in approximately half the space of a briefcase. The BJC-50 is approaching 50% smaller still.

Optional colour scanner.

For greater portability, both models include an infra-red port for totally cable-less communications with any suitably equipped Windows® 95 notebook or PC.

And, if you really need the functionality of an office in the space of a briefcase, both models will accept an optional colour scanner head in place of the print head. It takes only seconds to change the heads. You can then use the scanner head to acquire colour images, or for fax and OCR functions*.

Cable-less communication.

Canon Customer Care. All Canon printers feature a one-year warranty, upgradeable to three years for minimal cost, and are backed by Customer Care hot-line support. Drivers are available for DOS, Windows 3.1x/95 and Windows NT.

If you need help choosing between small, and smaller, give us a call on 1 800 021 167.

Canon portable colour Bubble Jet™ printers

Canon

Gateway Solo 3100 and Acer TravelMate 310 Series

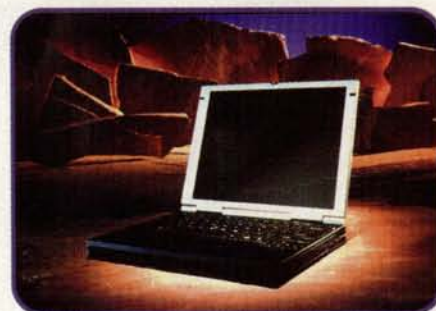
The Gateway Solo 3100 and Acer TravelMate 310 Series are excellent notebooks for those who travel extensively, as they are lightweight, yet packed with features you'd normally find on much larger notebooks.

Acer provided us with a TravelMate 311T, however, this was a pre-production model which is not available for retail sale. It featured an Intel Pentium 200MHz MMX processor with 32M of RAM and 2.1G hard disk drive. Our tests were conducted on this machine. The new TravelMate 312T, with an Intel Pentium 233MHz MMX, 32M of RAM and 3.2G hard disk drive is the

updated model, now available for \$3,599.

If you take an A4 sheet and fold it in half, you have the approximate footprint of the tiny 1.3kg TravelMate 311T. However, considering its size, features and weight, this notebook is one of the best 'travel' notebooks around. It is compact, featuring serial, parallel, external VGA, infra-red and USB PS/2 mouse/keyboard ports. The standard notebook also has an external floppy drive, external 24x CD-ROM drive, and integrated 56K modem. The battery didn't fare too badly either, lasting a minute shy of two hours.

The 8.4in active matrix display was



sharp, although our unit had a slight screen wobble problem in the bottom left-hand corner. The keyboard is small, but not too cramped to allow touchtyping. The glidepad was not as smooth as we would have liked, but adequate nonetheless.

The Gateway Solo 3100 featured a faster processor (Intel Pentium II 300MHz), more RAM (64M) and a crystal-clear 12.1in active matrix display. The hard drive was also larger at 4G, and a 56K PC Card modem and DVD-ROM are standard with the system. At \$6,092, this notebook carried a much higher price tag than the TravelMate.

Weighing 2.2kg, the Solo 3100 featured all the ports sported by the TravelMate 311T. Gateway also throws in Microsoft Office 97 Business Edition and 50 hours of Internet access with Telstra Big Pond to sweeten the deal.

Interestingly, Gateway did away with the trackpad navigational device for the Solo 3100, instead opting for a trackpoint device as used by IBM ThinkPads and Toshiba notebooks. Gateway executives said this was done to try to break into the US executive/business market which IBM and Toshiba currently dominate. We found the trackpoint a breeze to navigate.

The battery of the Solo 3100 lasted 40 minutes longer than that of the TravelMate. Because of the specifications and components of this notebook, it also outperformed the TravelMate in the Ziff-Davis WinBench tests (see results), but this was to be expected.

The Gateway Solo is a much more powerful notebook, with its results on par with the Dell Inspiron 7000 D300LT we looked at last month (see APC November, page 40); but if you want something you can carry around without feeling you are lugging around a couple of encyclopedias, the Acer TravelMate is a sheer delight.

Roulla Yiacoumi

Specifications and benchmark results

Product	Acer TravelMate 311T	Gateway Solo 3100
Distributor	Acer	Gateway
Phone	(02) 9870 1999	1800 5000 734
Online	http://www.acer.com.au/	http://www.gw2k.com.au/
Price	\$3,599 (312T)	\$6,092
Processor	Intel Pentium 200MHz MMX	Intel Pentium II 300MHz
Secondary cache	256K	512K
RAM	32M EDO DRAM	64M SDRAM
Hard disk drive	2.1G IDE	4G Ultra ATA
Hard disk file system	FAT32	FAT32
Video bus type	PCI	PCI
Video RAM	1.1M	2.5M
Video controller chip	NeoMagic MagicGraph 128ZV+	NeoMagic NM55 256-bit
Pointer device	Trackpad	Trackpoint
Dimensions (cm) (H by W by D)	3.6 by 23.6 by 17.5	3.1 by 28.5 by 21.5
Weight	1.3kg	2.2kg
PC Card slots	2 Type II or 1 Type III	2 Type II or 1 Type III
CD-ROM drive	24x external	DVD-ROM
Sound chip	Yamaha OPL3-SAx	Sound Blaster Pro compatible.
Modem	Integrated 56K	56K PC Card modem
Network interface card	Optional	Optional
Display	8.4in TFT	12.1in TFT
Maximum internal resolution	800 by 600	800 by 600
Operating system	Windows 98	Windows 98
Warranty terms	3 years limited local, 1 year international	3 years limited

BENCHMARK RESULTS

Business Winstone 98	14.1	Not run, see Note 7
CD-ROM WinMark 98 (K per second)	1016	968.7
CPUMark32	379.3	733.7
Business Disk WinMark 98 (K per second)	886.3	1066.7
High-End Disk WinMark 98 (K per second)	2320	3076.7
Business Graphics WinMark 98	75.4	107.6
High-End Graphics WinMark 98	104	139.3
BatteryMark (hours:minutes)	1:59	2:39

1. The product used in these tests is the shipping version available to the public at the time of publication unless otherwise stated.
2. Winstone, WinBench and associated products are registered trademarks of the Ziff-Davis Publishing Company.
3. These tests were performed without independent verification by Ziff-Davis Publishing Company.
4. To test the battery we had APM enabled on the notebook. All power-saving features were disabled.
5. Notebooks require an internal resolution of 1,024 by 768 to run these tests.
6. Winstone and WinBench were run at 16-bit colour depth.
7. The Gateway Solo could not complete the Winstone tests.

Only Canon offers a way to acquire and print images in colour with a printer and scanner in one!

Canon has a unique solution to a question that has often plagued colour printer users. How do you get the image in, so you can output it to your Canon colour Bubble Jet™ printer?

Only from Canon. It is an optional scanner head that fits right into your printer, and it is available on several models for just \$149^{RRP}.

It takes only seconds to replace the print head with the scanner head. This then allows you to acquire images for storage, editing, manipulation, placement on the Internet, or even OCR and faxing, with the right software.

Easy to use. To get you started, Canon includes image acquisition and editing software with your scanner head purchase at no extra cost! And using it, you can scan full colour or 256 grey-scale images in resolution up to 360 dpi. Or you can use high-speed

mode if you simply want Black and White at 90 dpi, supported by most fax software.

Best of all, Canon offers a full range of models with this remarkable functionality. They are the BJC™-50 and BJC-80 portable printers, the BJC-4300 and BJC-4650!

Canon Customer Care. All Canon printers feature a one-year warranty, upgradeable to three years for minimal cost, and are backed by Customer Care hot-line support. Printer drivers are available for DOS, Windows® 3.1x/95 and Windows NT.

If you would like to learn more about how to get your printer to input as well as output, call us on 1 800 021 167.



The BJC-4300 with PhotoRealism.



The portable BJC-80.



The even smaller, portable BJC-50.



The BJC-4650 for Windows and Macintosh and sizes to A3.*

Optional scanhead – just \$149^{RRP}

Canon

* Available approximately August. Price shown is the recommended retail price including tax. 1. Compatible with Windows 95 only. Canon and the Canon logo are registered trademarks and Bubble Jet and BJC are trademarks of Canon Inc. Windows is a trademark of Microsoft Corp. in the U.S. and other countries. Canon Australia Pty Ltd ACN 005 002 951 CS/5332

Canon BJC-4310SP

We were quite prepared to throw it into the 'yet another home inkjet printer' basket, but Canon's BJC-4310SP produced a few surprises.

At \$299 it certainly has the qualifications for a budget home printer and we weren't expecting anything terrific in terms of speed, resolution or colour. The first surprise, however, was its monochrome print speed. While no match for a laser printer, it managed a speed that could be measured in pages per minute rather than minutes per page, which is more usual for inkjet printers.

Print in colour, though, and you're back to minutes per page. An A4 page with coloured text and a pie chart took several minutes to print. Those planning to print photos had better grab a coffee, because it takes a while. Printing also takes up a lot of resources; everything ran considerably slower on our test PC during printing. Using the standard colour cartridge that comes with the printer, colour reproduction is impressive with coloured text, OK with

charts and line art, and reasonable with photos. But this means printing on high-quality inkjet, rather than plain, paper.

The next surprise was the BC-22e Photo-Realism cartridge. At \$89, only slightly more expensive than a regular replacement colour cartridge, its sharp images were fairly close to photo quality on good paper, but still rather ordinary on plain paper. Its handling of subtleties in colour and shade was particularly impressive, and something normally only seen in more expensive professional printers.

For an extra \$149, you can turn this printer into a scanner using the IS-22 scanner head, which slots in in place of an ink cartridge. Images are fed through the printer using a transparent plastic slip cover, possibly the least convenient way of scanning yet conceived. Scanning at high resolution is about as fast as printing in colour and, susceptible to dust, high-resolution scans needed a lot of retouching. By no means a professional scanner, output is sufficient for faxing and for scanning photos to use in a Web site or pre-



sensation. However, since flatbed scanners start at \$200 these days, it hardly seems worth it.

Josh Mehlman

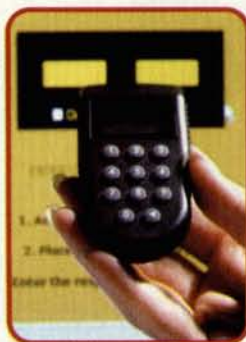
Canon BJC-4310SP

■ Distributor	Canon
■ Phone	Phone (02) 9805 2000
■ Online	http://www.canon.com.au/
■ Price	\$299
■ In short	Useful home printer with a few nice surprises.

Identikey

Security is one of the really big issues with extranets. Password protection may be adequate for some systems, but there is always a risk of data being intercepted, or passwords lost, stolen or discovered by unscrupulous individuals. A new product from Information Dynamics, called Identikey, is designed to protect access to a company's private sites on the Internet.

Identikey provides several layers of protection. The first layer involves using a physical token to access a site. This token, which looks rather like a small calculator, needs a PIN to activate, and will deactivate itself after a number of seconds if no buttons are pressed. Then comes the clever part: the Identikey server sends a 128-bit encrypted password to the user via a flashing Java applet that appears on the log-in Web page. The user holds up the activated token, and it will translate the flashing colours on the screen into a code, which appears on the console on the front of the



token. The user types this code in, and access is granted to the server. The code is randomly generated by the server and is constantly changing — so although the code the user types in might be susceptible to interception (additional security levels, such as SSL, can be used to prevent this), it will not work if someone tries to replicate the user's keystrokes.

Because each token is unique, each will generate a different code, indicating to the server which token is being used to access the site (so different sites can be delivered to different users). For those who cannot afford physical tokens, Information Dynamics also recently released a software token that can be used in lieu, although this obviously does not provide the security of a physical token.

On the server side, the Identikey application works only as an ISAPI service delivering ASPs. Thus, it requires Windows NT running IIS 4.0. User and token management is performed using an application called Identikey Manager — a simple

and clean system that any administrator should be able to come to terms with fairly quickly. The administrator sets up profiles for users, sites and tokens. Groups can be set up, passwords assigned (for an extra level of security) and access restricted to certain times and URLs on a per-user basis. Access logs are also accessed via this console. It is not, unfortunately, integrated into NT's other management consoles.

All in all, you can't get much more solid security than this, although it does cost — nearly \$12,000 for the server software alone, plus costs for each token and licence.

Nathan Taylor

Identikey

■ Distributor	Information Dynamics
■ Phone	1300 363 434
■ Online	http://www.identikey.com/
■ Price	Server software \$11,950; access licences start at \$350 for five users; hardware tokens start at \$84.
■ In short	An innovative product for top-flight security.



The PowerShot A5 is more than a digital camera, it's a Canon, which is why it's so small, so simple, so superior.

In a recent article Digital Camera said,

"For features, quality of output and price this little digi snapper should sweep the scene.

Pick it up...it's tiny. Put it in your pocket...it disappears. Shoot with it...it's a dream."

Here's why.

Smallest in its class. The PowerShot™ A5 combines advancements in lens technology, micro-circuitry and digital image processing.

The result is a camera that is the smallest in its class, with full automation for beginners and the performance for advanced photographic needs.

The 810,000 pixel resolution is high enough to produce exceptional photo quality prints in standard size!

35 mm camera performance. Canon has cut the times between operations common to digital cameras by up to 80%. This greatly assists auto focus, auto and programmable exposure and colour correction. Viewing on the revolutionary polycrystalline TFT

LCD screen offers exceptional image detail and a wide angle with reduced distortion in the 5 cm display.

More advanced users will find TTL monitoring, a break-through aspherical lens, an advanced range of aperture, shutter and colour controls including a colour mosaic filter, white balance and 30-bit signal input.

Focal length – 5 mm (equivalent to 35mm for 35 mm camera).

Industry standard memory – Stores up to 66 images using 8MB CF card supplied.



LCD viewfinder.

Serial port – For PC and Macintosh connections.

Full software suite. It also has one of the most complete software packages imaginable to let Windows® 95/98/NT4.0 and Macintosh® users begin enjoying the benefits immediately.

Canon Customer Care. The

PowerShot A5 features a one-year warranty upgradeable to three years for minimal cost, and is backed by unlimited hot-line support.

But then, what else would you expect from Canon? To learn more about our range of digital cameras call 1 800 021 167.



PowerShot A5 digital camera – \$1299^{RRP}

Canon

Defending Zip World

I am writing to express my extreme disappointment with an article about Zip World which appeared on page 128 in APC November. I don't know about the private correspondence between Zip World and yourself, but as a Zip customer, I know what took place publicly earlier this year. There doesn't appear to be much correlation between that and your article.

In your May 1998 article (page 157) you came down quite heavily on two aspects of Zip's performance, namely having trouble gaining a connection and very poor US ping responses. To top it off, a printing error caused Zip's details to remain unpublished. Even within the body of the Zip review, you mentioned that you had trouble with TPG and Microplex, approached them for an explanation and published that explanation. According to Zip, you never offered [Zip] the same courtesy. This is a legitimate concern . . . and it is odd that APC never offered to print Zip's response. Any credible publication would have extended at least that courtesy.

Zip took the only reasonable action it could: it posted a reasoned response to your article on its Web page, as was its right. There were certainly reasons beyond Zip's control as to why US ping times were so bad . . . and as a user I can confirm that it was indeed very short-lived . . . so short-lived that I never noticed the problem. For APC to publish, and not correct, a judgement that it was otherwise was very misleading. The Zip response was neither 'animated' nor 'nasty'. Strangely, these are the words you have used to describe it in the November 98 article.

The first three sentences of the November review imply that Zip only got upset because you attacked it, and that it had no reason to be upset. This is completely false and misleading. Furthermore, you mention that the file was removed, and the way in which you've written it implies that Zip World effectively admitted defeat. Again, this is very misleading.

Zip completely revamped its site, and since the issue was over and APC wasn't going to relent, it moved on. This, sadly, seems something you weren't able to do. You attacked Zip in May, it responded, and it appears you have carried a grudge since then . . . and out came the hatchet job at the first, but rather belated, opportunity. Would you care to explain what this attack on Zip has to do with its current performance and economy, something you were supposed to be writing about?

I am not writing to defend Zip, and I have no vested interests. Indeed I am often one to criticise it when it deserves criticism. I am writing as a disappointed APC reader. If I can see such a fabrication about an issue I know something about, how can I trust APC on other issues?

Robert Simons
Internet

Ed note: Quite a few readers have written to us about the Zip ISP review in APC November. They expressed surprise at some of the comments in the review and disagreed with our analysis — particularly comments on Zip's response to the previous negative review. Without going over old ground yet again, there's a lot more to the original review than was covered in the article. Zip's counter claims were demonstrably misleading. The review team's reference

to the saga was purely out of concern for our readers' interests. We do have genuine concerns about Zip's response and how it reflects their attitude towards valid criticism.

Having considered this at length, we stand by our reviews. In hindsight, however, the phrasing of the latest review could have been better balanced to avoid any possible interpretation of bias. It's unfortunate, because it's clear that a number of readers felt the review was unfair and we pride ourselves on being a reader-driven magazine. It was also unfortunate that in May the Zip tables were only published online.

Address confusion

I noticed in APC November that there is an advertisement by a company [NetRegistry] that registers some unusual Internet domain names. The Internet is confusing enough for the novice, but now we have domain names such as 'yourname.au.com'. Next we will have domain names such as 'au.yourname.www.com' and 'com.yourname.www.au'. Imagine if street addresses were listed in a similarly mixed-up way. The mail system would fall apart.

Grae Meyer-Gleaves
Riverhills, Qld

Note

In APC November, the review of TPG Internet did not take into account its new \$19.95 unlimited access pricing plan, although the pricing plan was noted in the specifications table. The review on our Web site has now been revised to take the new pricing into account.

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Virtual vaccination

Will next-generation neural networks allow our computer systems to be repaired and cleansed of viruses without us even knowing there was a problem?

By Helen Dancer

Symantec CEO Gordon Eubanks is spot on when he says that customers are more worried about the things they don't know about that might go wrong than the things they know about. It's a logical extension of the fear of technology, or the fear that its sophistication is far beyond our comprehension.

Threats from outside, such as viruses, trojan horses, and so on, lurk on the fringe of our fears. Efforts to prevent damage to corporate data from a rogue piece of code, which can enter an organisation's network covertly and often by accident, take up an inordinate amount of IS departments' time and energy.

It is a delicate but palpable irony that the work of hardly more than a couple of hundred teenagers worldwide has given rise to a multibillion-dollar software industry, but the risk is real, and increasing. Ironically too, the damage done by many of the viruses strutting the world's stage is not the result of evil genius but of poorly written, dodgy code, the product of second and third-rate hackers that simply confuses the average PC. That's cold comfort to the average corporate IS manager who has lost invaluable data and has had to spend the weekend cleaning out and restoring systems.

Charting the rise of Windows provides some insight into the way viruses originate, replicate and mutate. File viruses all but disappeared in 1992, coinciding with the advent of Windows 3.1; and boot viruses were to a large extent killed off by the release of Windows 95 in 1996. Each created a computing environment that was not conducive to the spread of each kind of virus.

Macro viruses, on the other hand, which are spread in email, still exist and even flourish in Windows 95/98.

So viruses are spreading faster, because we work faster, and share information faster. Once they travelled by sneakernet on a diskette, hand delivered from one person's computer to the next. Today they fly across a network or the Internet, and can visit a number of people simultaneously, in a single email.

Steve White, senior manager of the Massively Distributed Systems group at IBM's TJ Watson Research Center in New York, asserts that since people are already exchanging active content far faster than

have come into contact with any virus it encounters on any given day. Macro viruses are prone to spontaneous mutation, White said, and acclimatise to different conditions, generating an almost infinite number of variations.

His solution, and the basis of a major research project under way at the TJ Watson Research Center, is the idea of an intelligent network monitoring system based on neural network technology. This would have at its core a detection heuristic which deconstructs the program from the virus

The work of hardly more than a couple of hundred teenagers worldwide has given rise to a multibillion-dollar software industry.

they used to exchange floppy disks, the speed of the response to viruses also needs to accelerate. The response has to be faster than user alerts, and faster than the viruses travel.

That's an apparent conundrum, however, since it implies that the email solution needs to travel faster than the email that alerted the centre to the problem (over the same medium), or that in fact virus control agencies need to set themselves the task of responding to the virus alert before the customer has even become aware that they have a potential virus infection.

Macro viruses, he said, spread four times faster than the previous generations of viruses, and are also four times more likely to be spread into the wild. He estimates that there's a few years between when a virus is actually created and when it is deliberately launched, or accidentally escapes into general distribution.

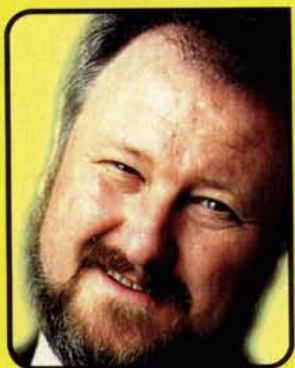
Like biological viruses, it's increasingly likely that your own system will never

imprint, reconstructs it, and then sends the imprint to what IBM calls the Digital Immune System for analysis.

Through the use of neural networks, the researchers are training the system to learn to tell the difference between infected code and uninfected code (as opposed to, say, poorly written code in standard applications), and in the process they are refining the parameters for detection. White is satisfied that they are developing a better rate of false positive identifications, which of course means it's not there yet, but just around the corner.

All of this augers well for that endless argument that more people would use computers if they weren't so darned difficult, but causes me to ponder on yet another area of computerdom being taken out of public awareness.

Will the next step be being told whether the room my computer is in is too hot or too cold? Will my computer one day act as my pseudo-grannie and suggest I put on a jumper every time I sneeze?■



That vision thing

The millennium provides a unique opportunity to re-evaluate how Australia operates as a society.

By Jeremy Horey

I still find it hard to believe that the Australian people would elect into government a party that displayed such a lack of vision during the election. John Howard's vision of the next millennium consists of a new tax and a return to the social values of the 1950s.

The millennium provides a unique opportunity to re-evaluate how Australia operates as a society and as an economy. And we do need a re-evaluation that goes beyond a facile observation that the tax system is not working perfectly.

We need to take a long hard look at the changes that are sweeping through the world, so that we can start to see how our social and economic structures can adapt to meet these challenges. We need to understand how to deal with these changes, so we can ensure that we will all benefit from them, and they enhance our country and our society. This can't be done with a new tax and some old social values.

First of all, let us look at what kinds of changes we are facing. A good place to start is with a little history. Sometime around 1973, the relaxed and comfortable world order that appeared after the end of World War II came to an end. While the Cold War may not have been 'relaxed', it did provide stability for 25 years.

Since the early 1970s, a lot has changed: the economy, society and the end of the Cold War. The simple dichotomy between capitalism and socialism proved to be a set of blinkers imposed by a historical accident.

As we search to find new principles to organise the world, we are riding a roller-coaster of technological change. Everything from the genes that make us human to the way we move materials around the world is changing, or is open to change.

The Internet is one example of the tech-

nological developments that are driving change. It is changing the way businesses and their customers and suppliers interact. It will radically transform at least half of the business landscape by the end of the first decade of the next millennium. But the Internet is only one example of what cheap computing power can do.

More and more appliances, machines and other devices use embedded microprocessors. Adding 'intelligence' to these devices changes the way they operate. While robots have not been as successful as their proponents believe they should

falling over themselves to provide this sort of service.

This approach provides better service for customers, but the real carrot for a business is that it no longer has to keep stock. If everything is manufactured to meet a customer's order, the business no longer has to carry inventory. Saving the costs of keeping supplies of raw materials and stocks of finished items makes it worthwhile investing in advanced systems.

These changes will have profound effects on our economy and our society, and they are coming whether we like them

As we search to find new principles to organise the world, we are riding a roller-coaster of technological change.

have been, the true success of automation is in the widespread use of simple intelligent devices.

Everywhere, there are chips in everyday devices. There are microprocessors in fridges, cars, VCRs, telephones, cameras and so on. In the consumer sphere, these range from light switches that respond to voice commands to navigation systems for cars built around Global Positioning System receivers.

In manufacturing, embedded microprocessors allow intelligent manufacturing systems to produce items customised to precisely fit a customer's order. In the US you can order a pair of jeans individually tailored to fit you for just a little more than what you would pay for an off-the-rack pair. Dell is another example of this trend. If you order a computer from Dell, it is built to match your order. You may have to wait a few days, but you get to configure your machine from a wide range of components. In fact, manufacturers are

or not. They make too much sense for businesses not to adopt them. But we have a chance to think and plan ahead.

We have a choice on how we adapt to what is happening. We can use these changes to strengthen our society; to ensure that no-one is left without proper food, proper clothing, proper accommodation and good education. We can use them to ensure that Australia is internationally competitive, at the cutting edge in building a new society and is a centre for innovation.

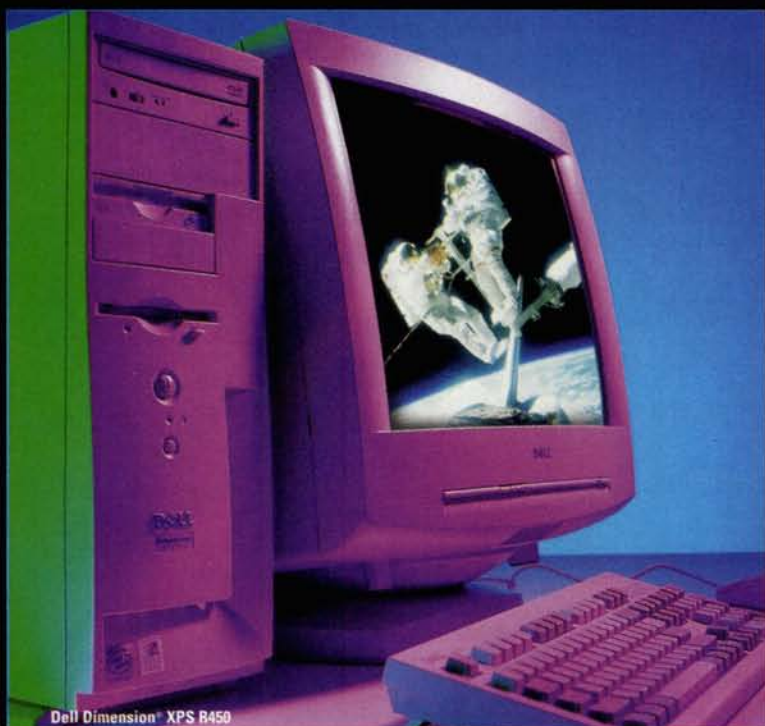
But we won't do that if all we can see in front of us is a new taxation system. We need leadership, which neither party is providing.

We now have three years until the next election. We can use this time to plan the future that we want. Or at least work out a way to involve all Australians in planning for that future.

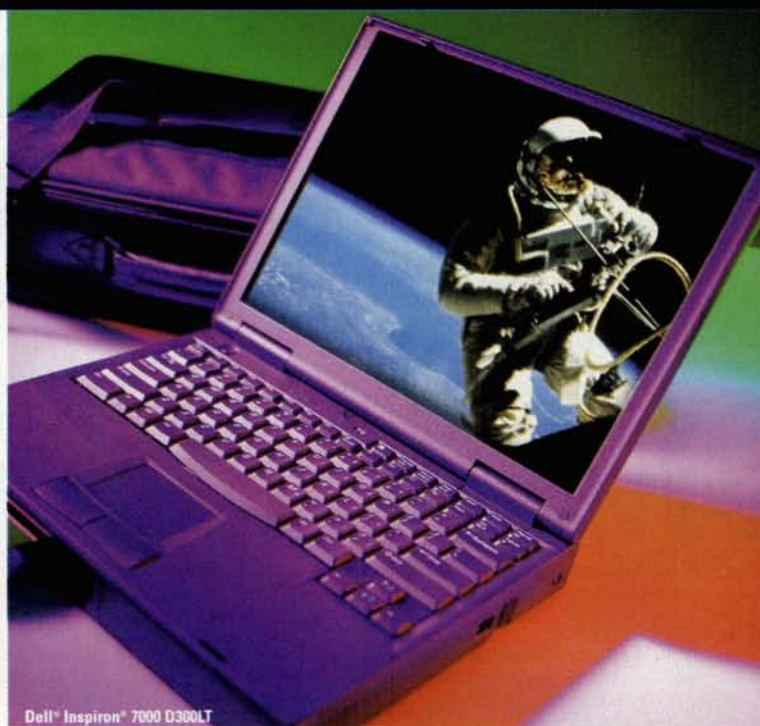
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Connection guarantee? I'd like to see that!

An estimated 1.5 million businesses are connected to the Internet, which is rapidly becoming an essential service along with gas, water, electricity and telecommunications. Yet we are still being forced to live with less than reliable connections.

By Cathie Kennedy

Late in September, the explosion in Esso's Longford Plant One left the state of Victoria without gas supplies for just on two weeks. Figures compiled by the Australian Industry Group suggest that the state's manufacturers lost more than \$100 million in production per day, and total losses are expected to run as high as \$1.4 billion. Some estimated that up to 100,000 workers were stood down during the crisis. It practically brought the state to its knees.

While there was an overwhelming sense of sympathy for the families and friends of the two men killed in the explosion — and those who were injured — Victorians were facing life for the first time without access to a basic utility. That meant no cooking, no heating and no hot water for the 1.3 million domestic gas customers in Victoria.

The crisis provided a unique insight into how dependent we have become on utilities and services. When we pick up a telephone handset, we expect to hear a dial tone. When we plug a cord into a power outlet and flick the switch, we expect to access electricity. When we turn on a tap, we expect to see flowing water. And when we plug into the corporate network, we expect to transparently and automatically access the LAN and WAN.

When we are deprived of a basic service, we marvel at how anyone ever managed without it. In Victoria, survival without gas was the topic of conversation. One radio station ran a competition to give away an electric hot water system every day, another initiated a drive-time cooking segment called 'Cooking Without Gas'. A third station held a free BBQ for listeners left without cooking facilities. Even the hospitality industry exploited the publicity opportunity; the Windsor Hotel opened 27 rooms to the public for free hot showers.

Our increasing reliance on the Internet is no exception to our growing dependence on services. Many of us have become reliant on electronic mail to communicate with friends and business associates, and to transmit files and information.

The trend is clear: the Internet will become as ubiquitous as the telephone. Only the Net is being adopted much faster than the phone was. The Internet gained 50 million users in less than four years; it took PCs 16 years, television 15 years and radio 58 years to reach the same penetration.

It won't be long before a critical mass begins to demand quality service from ISPs.

However, when compared to other services, it seems that reliability of access to the Internet still has a way to go. Those of us who use a 33.6K or 56K modem to access the Web and email are all too familiar with line dropouts and intolerably slow connection speeds. Sometimes numerous dial-in attempts are required before connecting to our ISP.

Just a decade ago, I recall the regular occurrence of the network going down here at APC. No pain, no gain, the network manager was wont to say. Part of the gain of having a corporate LAN was that access to the service would regularly be denied. Still, an unreliable network was better than the alternative of the day, sneakernet.

Today, however, users of corporate networks have immeasurably higher expectations. It's a network manager's nightmare, struggling with sometimes unrealistic demands, diminishing budgets and more complex networks that extend to offices and remote sites around Australia and the world.

In the early '90s, mission-critical net-

works, total redundancy and 100% uptime became the buzzwords of network service providers differentiating themselves from the competition. High availability, it was realised, had become essential for many organisations, and there was a substantial market up for grabs. Today, service level agreements are an expected component of any networking contract.

It seems that Internet services today are where LAN services were a decade ago. We have come to increasingly depend on

access as a critical form of personal and business communication, yet we still have to accept less than 100% availability.

When will ISPs begin to realise that users are starting to demand reliable access to the Internet, just like the telephone network, the electricity network and the corporate network? When will service level agreements become the norm for every ISP subscriber connection?


An estimated 1.5 million businesses are connected to the Internet. We are fast approaching the point where a denial of access to the service, like the gas crisis, could mean the demise of countless businesses.

It won't be long before a critical mass begins to demand quality service from ISPs. Yet ISPs are missing the mark. Rather than promise value-added services, the most points-of-presence, the lowest connection rates, why not offer something more fundamental? There are many of us who long for the day that our Internet access becomes as seamless and as reliable as our gas, water, electricity and telephone access. So take heed ISPs. There's a whole market out here waiting to be serviced. ■

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Whose turn to rule?

Which of our unlimited wants should we satisfy with our limited resources? The economic problem dominates our lives.

By Julian Ehrlich

We can't have everything, can't spend the same dollar twice, there's no Magic Pudding and, although Santa Claus is coming to town, the story about him leaving gifts omits the bit about him taking the gifts from the industrious elves.

Those building Australia's telecommunications environment ignored the economic problem thinking we could have all the initials like PSTN, ISDN, IP, FR, X.25, CDMA, TDMA, LEO and ADSL; and lots of exciting information superhighways from the variously pronounceable, timid and friendly 'coax' of my childhood to today's more ominous 'hybrids'.

If you try to build everything, then maybe you don't build hospitals or schools or universal work-based child care or provide a decent aged pension.

Who makes the decisions? That is the political problem. Not the trivial issue of monarchy versus republic, or 'democracies' versus 'dictatorships'. But the more fundamental problem set: who is to rule? In whose interests is the 'ruling'? What limits are placed on 'ruling'? And who is going to pay for all this 'ruling' anyway?

So if Australia's telecommunications tangle was not the only way, what was the alternative?

First must come the realisation that 'competition' and 'the market' only function effectively with an approximation of pure, perfect competition in which all buyers and sellers know each other's costs and prices. But as Adam Smith observed so long ago, no sooner do merchants gather together than they immediately set about conspiring to fix prices. While there need be no actual conspiracy, it is not coincidental that Ansett and Qantas fly similar schedules, similar planes, and ticket at similar prices.

It is also no coincidence that telecommunications carriers will do anything to obscure costs, confuse pricing calculations, and create layer upon layer of con-

sumer complexity while enthusing about how easy everything is.

Second, markets need depth of activity to have the financial liquidity to operate. With a population of less than 20 million Australia will never have enough depth of market to support anywhere near the number or range of telecommunications vendors in Northern America with its population of some 350 million.

Third, the Pareto Principle states that, in the absence of state intervention, inevitably 80% of resources will be owned by 20% of people. This is because wealth makes it easier to survive bad periods and easier to take advantage of good periods. Australia once had, for its population, an enormous range and variety of newspaper and magazine publishers. Estimates vary, but some 85% of the market is now dominated by only two vendors. Why will telecommunications be any different?

Fourth, governments are notoriously bad at running things. Professional public servants have the same talents and abilities as professional administrators in private bureaucracies. But today's governments have no concept of the common good to guide their actions or even inspire their election campaigns. Hence their fixation on reducing taxes and government functions (but, I note, never a pro rata reduction in ministerial salaries) with the closely related interference in the operation of public enterprises.

Fifth, Australia has always had to import capital in various forms: actual cash or state-of-the-art technologies such as steam engines in the 19th century, steel for the Harbour Bridge in the 1930s, later still aeroplanes or, today, information technologies.

Armed with these five basic points, how should Australia's telecommunications sector have been organised?

Telecom should have been broken into four basic parts: Urban Infrastructure, Remote Infrastructure, Research and Development, and Service Retail.

Infrastructure should have remained a government monopoly. (Don't scream yet.)

Each organisation would have its own board whose members would *not* be government appointees. Rather, they would be elected by customers with voting powers varying in accordance to the size of their phone bills. Overcharging a segment would directly increase their franchise — a nice balance.

The customers of the Urban and Remote Infrastructure operations would be the government's own Service Retail and other privately owned service providers. Again, boards would be elected according to the phone bill. So the unduplicated infrastructure would be shaped by the commercial requirements (and inevitable struggles and compromises) of those vying to sell product and service to the residential and commercial public.

Note the differences. Minimal waste of scarce capital. Policy power transferred from will-o'-the-wisp politicians to true stake holders. A voting system to empower victims of price gouging. The same infrastructure access costs (or more power) for resellers.

So... Who is to rule? Customers whose contracts are otherwise tradable commodities giving value to telecommunications carriers.

In whose interests is the 'ruling' to be? Customers, not hardware vendors, not service providers, not bankers. Customers, conservatives tell us, are supposed to be king.

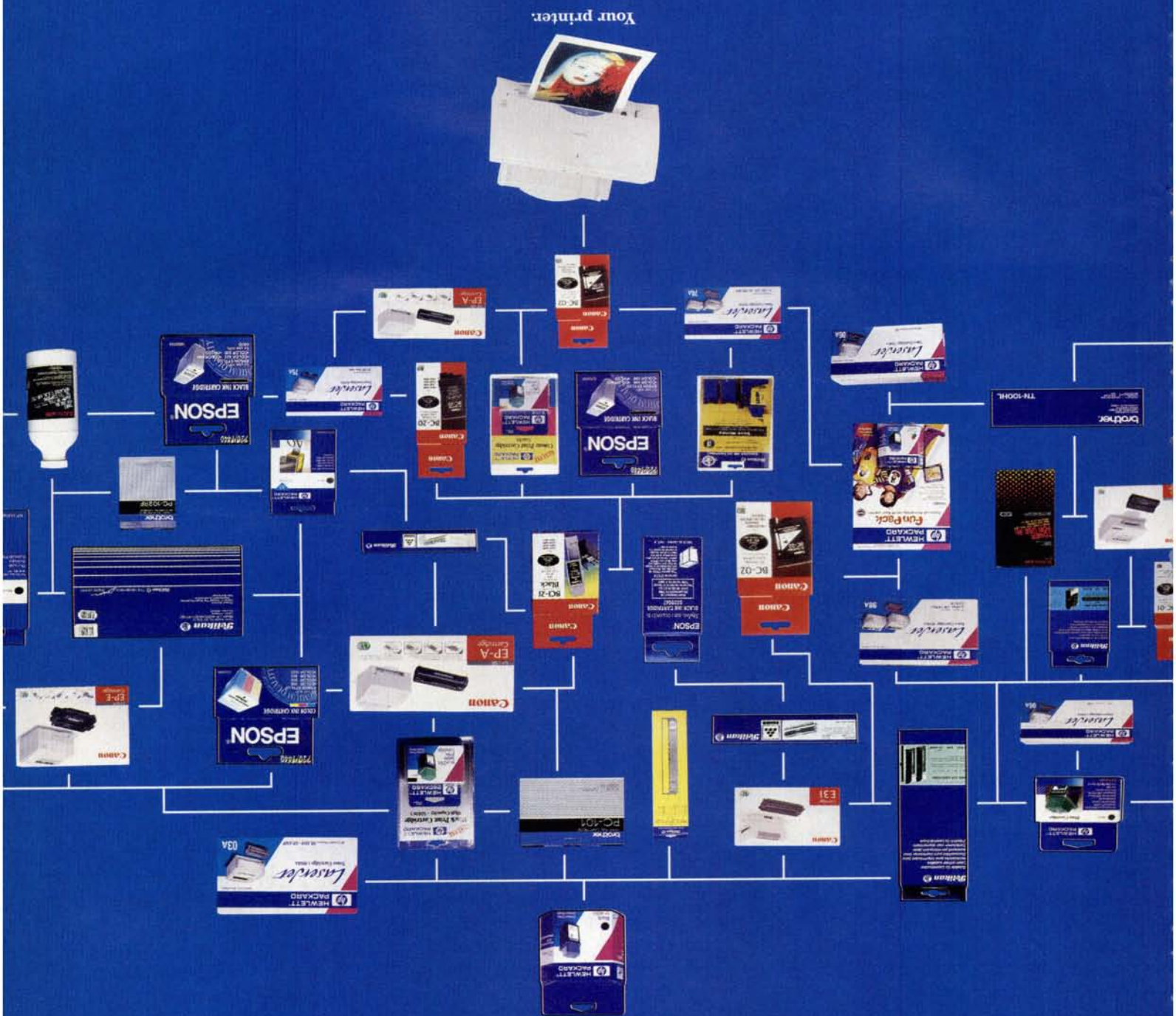
What limits are placed on 'ruling'? Regulation should ruthlessly prevent the disenfranchisement of residential or commercial customers. Everything else will take care of itself.

And who is to pay for the 'ruling'? Customers, since they ultimately pay for everything anyway.

So why was it done differently? We were more interested in telecommunications service discounts than the discounting of our citizenship. ■

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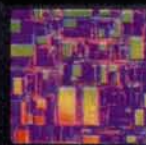
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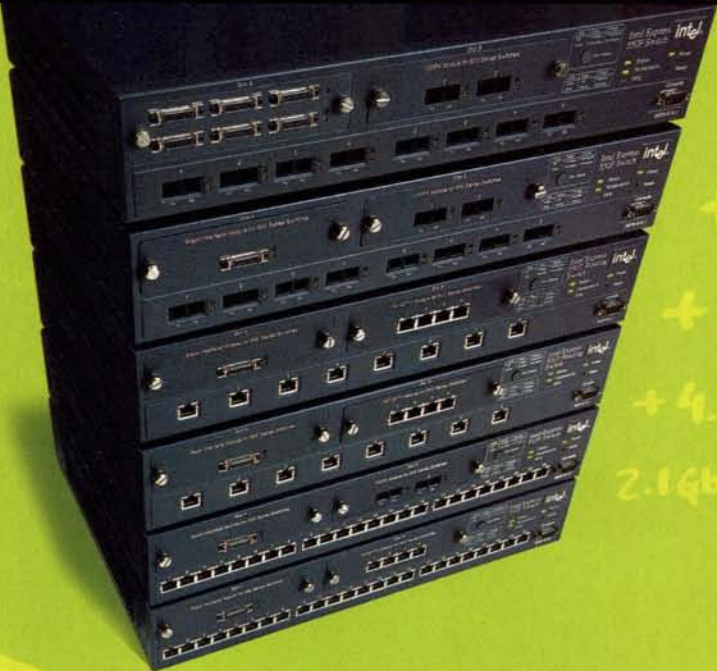
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Voodoo2



Voodoo2-based add-on graphics card will be at the top of hard-core gamers' wish lists for Santa this Christmas.

Retailers told Price Watch the two most popular models are Diamond's Monster 3D II and Creative's 3D Blaster Voodoo2. Both cards are based on 3Dfx's Voodoo2 chipset. So far this chipset has been unsurpassed in its 3D performance. It provides great Glide acceleration for diehard gamers, and is supposed to be three times faster than the Voodoo graphics chipset. It supports 3Dfx Interactive Glide, Direct3D, OpenGL, QuickDraw and 3D Rave.

3D add-on upgrade cards only render 3D; they work in conjunction with your VGA graphics card, which still carries out 2D rendering. Voodoo2-based cards are full-screen, 3D-only solutions and use an external pass-through cable to connect to your computer's existing video card.

The first Voodoo2-based accelerator cards came with 8M of onboard RAM but the latest, more expensive models come with 12M. Both Diamond and Creative produce 8M and 12M versions and their cards are very similar, but they're not your only option. There's lots of other brands available, including the Canopus Pure 3D II, STB Blackmagic 3D, Metabyte Wicked3D, Jaxx Renegade 3D, and other generic Voodoo2-based boards.



Price Watch obtained quotes from six different retailers, and prices ranged from \$315 to \$649. Surprisingly, the cheapest quote for an 8M board was for the Creative 3D Blaster Voodoo2, at \$315. The two generic boards, the APAC VD200P 3Dfx VoodooII and PV830 Voodoo2 3Dfx, were the cheapest 12M cards by far, at \$350 and \$320 respectively. The next cheapest 12M card was the Creative 3D Blaster Voodoo2 for \$395 from KS Computer Technology, but this was a special advertised in October and is only available while stocks last. Creative's recommended retail price for the 12M card is \$699, but the World Cup Celebration Edition is still available in some stores for \$470 for the same card — it's just bundled with the Actual Soccer World Cup Celebration Edition game title instead of Incoming.

Price Watch received several quotes on OEM (Original Equipment Manufacturer) bundles, which are intended for computer manufacturers and dealers but can be purchased by the general public. An OEM package usually just means it does not come in retail packaging and often doesn't include extras like software, games and



cables. The product is no different in terms of specification and performance.

See this month's Technobabble to find out how 3D works.■

Our charter and method

Price Watch is an exercise in comparative technologies and relative prices. All investigations are conducted anonymously, and records are kept of conversations. Prices and system capabilities printed here are provided by the sales staff at the offices we contacted, and all information is as supplied. While we assume that these are correct, we cannot accept any responsibility for errors or omissions. Neither will we be held to account by companies mentioned here for omissions to product ranges or system capabilities. The responsibility rests with sales staff to provide adequate information, as the company would expect them to do with every customer.

VoodooII-based graphics cards

Company	Contact	Product	8M card	12M card
Adelong Computers	1800 626 345 http://www.adelong.com.au/	Creative 3D Blaster Voodoo2	\$485	\$575
		Diamond Monster 3D II	\$429	\$565
		Orchid Righteous 3D II	\$455	\$475
BBD Computers	(08) 9450 2179 http://www.bbd.com.au/	Creative 3D Blaster Voodoo2	\$349	\$649
Computer Market On Line	(02) 9716 0670 http://www.computermarket.com.au/	Creative 3D Blaster Voodoo2	\$315	\$470 (World Cup edition)
		Diamond Monster 3D II	\$405, \$335 OEM	\$540, \$450 OEM
		APAC VD200P 3Dfx VoodooII		\$350
Frank's Compware	(02) 9755 4888 http://www.compware.com.au/	Diamond Monster 3D II	\$375 OEM	\$520, \$495 OEM
		Generic PV830 Voodoo2 3Dfx		\$320
		Skywell Magic 3DII		\$425
Harris Technology	(02) 9925 9925 http://www.ht.com.au/	Creative 3D Blaster Voodoo2	\$404	\$477
		Diamond Monster 3D II	\$427	\$556
		Orchid Righteous 3D II		\$565
		Professional Graphics BlackMagic 3Dfx		\$599
KS Computer Technology	(02) 9568 5588	Creative 3D Blaster Voodoo2	\$395	\$395 (until stock lasts)
		Diamond Monster 3D II	\$395, \$350 OEM	\$400 (OEM)

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Where do you look when shopping around for a good service provider? **By Roulla Yiacomini**

Shopping for an ISP

You've had enough of your ISP. The staff never return your calls, the modem performance is shocking, and the price is about to go up.

But where do you begin shopping around for a new ISP? Do you read reviews in magazines? Go searching online? Or keep an eye out for advertisements or special offers that may come your way?

In APC's most recent ISP Service & Reliability survey (for full results, see APC November, page 103) we found most users chose their ISP based on comments

they'd heard from others. Word of mouth accounted for 36.2% of responses and ISPs such as PowerUp and iinet had much higher figures — closer to 60%, in fact.

If you are considering a new service provider, the most valuable advice you can receive is from people using that ISP or who previously used that ISP.

This month, we bring you a selection of the Australia-wide reader comments from our 1998 ISP Service & Reliability survey. If you'd like to send me any comments of your own, please write to ry@acp.com.au.■

TAKE A BOW

In the almost two years I have used Big Pond, I have only encountered an engaged tone once — and I dial in at least five times a week. Also, the only time there was a major network problem and email was down for three days, each user received free time for that month based on their plan.

James Bellis
St Kilda East, Vic

I set up my OzEmail account on New Year's Eve and received prompt effective phone and fax support at 1am.

Richard Chittleborough
Lonsdale, SA

Shoalnet is very good with support and nothing is ever too much trouble for them.

Bill Clarke
Nowra, NSW

Zip gives a daily report to its users about upgrades, problems, workarounds that occur on the ISP which I find very interesting/amusing and is indicative of a more honest ISP that is reporting back to its users.

Dominic Rocheta
Arcadia, NSW

InterACT is a friendly, informative and service-oriented ISP which I have recommended to others without hesitation.

Dean Edwards
Queanbeyan, NSW

Odyssey is the most reliable service that I have used. The customer service is excellent and very friendly and I highly recommend them to any Brisbane user.

Troy Robinson
Bald Hills, Qld

ROOM FOR IMPROVEMENT

Avoid ISPs that allow unlimited access accounts like the plague! The day after OzE-mail offered such a plan, I was no longer able to access them.

Jolyon Hawley
Rydalmere, NSW

Telstra Big Pond has a good way of making money — by charging for unconnected calls! It was only by checking my last three months' accounts that this became evident.

Brian Squires
St James, WA

Sometimes it takes five to 10 phone calls to get a One.Net line that works, and I don't mean busy calls. These calls supposedly connect — but don't — and some months end up costing me more than my monthly access fee.

Daniel Purdie
Runcorn, Qld

Zip is poor. Its ping times are disgusting and their billing leaves a lot to be desired. I have had five incorrect bills in eight months.

Stephen Holmes
Rosemeadow, NSW

GigaNET had the worst customer support I have ever experienced.

Chris Dalby
Landsborough, Qld

You can rarely get through to Dynamite's tech support. And I found that even if you do, they often can't answer your question.

T Brusse
Banks, ACT

I use HardNET and have never had a reply to an email inquiry or complaint.

Paul Sheahan
Healesville, Vic

IN GENERAL

ISPs that only deal with credit card enabled customers will never get my business.

Nick Morgan
Inglewood, WA

I would like to see more ISPs sell blocks of hours, for example 100 hours for \$250. This would take the guesswork out of choosing a pricing plan based on a certain number of hours per month.

Desmond Lane
Melbourne, Vic

There should be more competition between the major ISPs. I'm afraid that the two biggest ISPs will end up like our domestic airlines, with not much difference in their pricing.

John Krylyszyn
Kuranda, Qld

The recent case of two schoolboys running an unsuccessful provider indicates the industry needs some self-regulation and legal support for users.

Darryl Rubiolo
Kingsgrove, NSW

There should be more ISPs that have a toll-free number.

Martin Major
Tom Price, WA

More competition is required in country areas to bring service levels up and prices down.

Hans Aulmann
Kalgoorlie, WA

In my opinion, the traps and hidden charges of some ISPs put them in a criminal class.

Jeff Muegge
Magill, SA

Poor service drives customers away.

Dave Boxwell
Winmalee, NSW

Once you establish an email address with an ISP, you don't want to change it every time a better deal comes along.

Chris Garcia
Kanaooka, NSW

Many users don't shop around for the best deal or most suitable for their needs and end up paying more than necessary.

Rob Cole
Hawthorn, Vic

Unless you're willing to pay big bucks, most ISPs are nowhere near as fast or reliable as they advertise.

Steven Rafos
Rockdale, NSW

There are numerous benefits to looking beyond pre-printed forms.

Getting smarter about printing

These days, vendors use acronyms like ERP and CRM to convince corporate customers to invest millions of dollars re-engineering their company around a business-focused IT infrastructure, all underscored by the promise of truly momentous cost savings. It's hardly surprising then when customers focus on big-picture issues but forget to consider how individual business processes can be improved by the intelligent deployment of specific technologies.

Forms, in particular, continue to be a major obstacle to the dream of the paperless office. Indeed, a recent Gartner Group report estimated that 83% of all business documents are forms: customer information forms, change request forms, leave authorisation forms, supply ordering forms — and, of course, outgoing communications such as form letters. Maintaining so many different forms has also forced companies to develop ways to track, print, store, distribute, collect and computerise them.

The Gartner Group study estimated that companies spend around \$US6 billion on pre-printed forms every year, while the cost of using and managing those forms was pegged at an astounding \$US350 billion.

Fortunately, there is a better way, if companies are willing to go against the conventional wisdom that pre-printed forms are a necessary evil of doing business. For those companies that have taken the plunge, the result has typically been massive savings with minimal expense.

Let your printer do the walking

For companies that rely on pre-printed forms, one viable option is to look into a solution such as Lexmark's Australian-made Optra Forms, which intercepts ASCII output from business applications, and then merges it with predefined forms that are stored in a networked Lexmark laser printer's Flash ROM. Bold face, italics, fonts, images and watermarks are among the formatting options that can be used to touch up printed forms.

The Royal Perth Hospital (RPH) recently implemented Optra Forms to upgrade its patient label printing system,

which generates labels to identify medical records, test samples, and the like. Until then RPH had used dot matrix printers to print the labels using its TOPAS patient management application.

Using Optra Forms, the quality of the printed labels has improved; barcodes, for example, are much sharper than they were before. Even better, the RPH no longer has to throw out rows of labels that were wound through the printer as employees aligned the print head. More than 10 million labels are printed by RPH each year, so simply being able to use two extra rows per sheet is expected to save the RPH more than \$18,000 a year on blank labels.

Storing templates in printer firmware, instead of keeping pre-printed forms in warehouses, also eliminates wastage when those forms are outdated: revised forms are automatically propagated throughout every networked Optra Forms printer.

Cutting out paper

The benefits of printing forms when they are needed, instead of *if* they are needed, are obvious. But for companies that need to act upon the data in those forms, totally electronic forms may be a better choice.

Canadian company JetForm offers an electronic forms (eforms) creation and distribution system that lets employees fill out forms directly on the computer (a planned Web-based interface will obviate the need for specialised JetForm clients). Integrating with workflow applications such as Lotus Notes and Microsoft Exchange, JetForm handles the distribution, escalation and collaboration necessary to turn form-based data into usable business information.

The key to success is to embrace eforms wholeheartedly. The Department of Defence is saving \$48 million annually after deploying 430 different JetForm eforms to thousands of its users across Australia.

Such dramatic cost savings are available to any organisation that is willing to seriously rethink the way it handles forms, said Hugh Millikin, senior vice-president for JetForm Asia-Pacific. With dozens of success stories under its belt, JetForm is now taking this message to cash-strapped companies in Asia.

Although most Asia-bound companies try to start small in countries such as Malaysia and Thailand, JetForm is headed straight for the region's two largest markets — China and Japan — because their sheer size means they have the most to gain from electronic forms.

"In Australia, the major banks each have around 1,000 branches, whereas many Chinese banks have more than 50,000 branches," Millikin said. "They obviously have major problems with forms; distributing forms among 50,000 branches is not only a costly exercise, but is even more difficult given China's road infrastructure. Using eforms technology, companies like that can automate transactions between their branches quite cost-effectively, and gain the ability to move data in ways that just weren't available before."

Personalise or perish

Although improving forms handling infrastructures can trim ongoing printing costs, companies should also consider how smart printing can improve customer service, advised Patrick Dowling, customer relationship manager with mass printing specialist Cincom Systems.

Companies that collect and act upon detailed information about customers can make much more of an impression than those that rely on impersonal mass mailings, Dowling continued. For example, visually-impaired customers might be sent a letter in 14-point text instead of normal 10-point, while non-English-speaking customers would ideally have all communications sent in their primary language. Although collecting such data can be costly, the extra investment will be recovered by the ability to win, and keep, new customers.

There are clearly substantial rewards for companies that balance the hype about total enterprise computing solutions with a micro-management focus on using technology to improve specific business areas. By increasing both the efficiency and effectiveness of printed communications, companies can quickly recover their investment and begin profiting from the benefits of truly intelligent printing.

David Braue

*What you see is
what you get — or is it?*

Image conscious

The digital age has provided the publishing world with plenty of opportunities to make its products look more interesting and exciting, as well as easier to read. Information is simpler to produce and can sometimes reach its audience instantly. However, the same phenomenon has also created a new question: when is what you see reality, and when is it manufactured?

The use of virtual advertising by the Seven Network during the broadcast of the July Bledisloe Cup rugby test between Australia and New Zealand at the Melbourne Cricket Ground is one recent example of technology playing tricks on us. Around 10 times during the live television telecast, the logo for a brand of sports shoes was superimposed over a small section of the crowd.

An investigation by the Australian Broadcasting Authority found that the Seven Network did not breach the Commercial Television Industry Code of Practice. It said the ads were readily distinguishable by viewers as commercials as opposed to program material and that they did not interfere with the main component of the program, the game itself; however, consumer groups and sports associations are still concerned about the implications of such advertising. The Seven Network has the exclusive rights to use of the technology in Australia, New Zealand and South Africa for the next 15 years. It sees the technology as a potential source of enormous revenue.

Manipulation of images is not a new phenomenon, but the age of the PC has increased its use and ease. There are plenty of software packages on the market that can alter everything from photos to graphs. Photoshop, Corel Paint, xRes, Live Picture and Paint Shop Pro come to mind instantly. Many of these programs were intended to change photos and images to enhance them for publication — all APC images are scanned and then colour corrected as part of the production process — while others are used for fun to alter digitally captured family snaps, to give little



sister a beard and an elongated nose, for example.

However, news organisations and image libraries are sometimes taking the process one step further, actually changing the meaning, composition and participants in photos. Sometimes it is simply removing a few wrinkles from the corner of a covergirl's eyes, but it can go a lot further.

Art directors suggest there can be no set rules on how far this manipulation should extend, that it is a case of interpreting every picture individually. Here is one example a graphic artist used to illustrate this point: Princess Di travelled to the Bahamas, but your photographer didn't get a shot of it. What do you do? Well, you could easily get an image of her on Bondi Beach and change it to show a Bahamas backdrop. It may not itself be a real-life shot, but it is portraying reality is it not? It is lying to the eye, but is it a lie?

The Media, Entertainment and Arts Alliance's federal secretary, Chris Warren, said that the media should follow a general ethical rule: if there are changes made to images, these should be clearly stated, so that it can be easily recognised as a manipulated photo. This way individuals can reach their own conclusions as to the emphasis that should be placed on the photo and the information it conveys.

In other countries, photographers have special rights to restrain the use of

their images, added Warren. Moral rights legislation, expected to be brought before the Australian federal parliament in the next term, would ensure there is legal redress if photographs are used in a way that distorts the nature of the work, he said. Photographs are supposed to reflect reality, he said. It is not like a work of art that you start from scratch, but a piece of frozen time, and altered photos can be misleading.

One Australian Consolidated Press magazine cover caused a stir when its digitally manipulated cover image depicted a man rescuing a child surrounded by a wall of flames. The original photograph did not include the flames, and many of those involved in the fires being covered were offended by the image.

In another well-publicised instance, a Murdoch newspaper changed the eyes of an alleged killer, who has since been convicted, to look evil. Newspaper representatives said the change was accidental, and that washed-out eyes were the result of a production process. At the time the image was printed in the newspaper, the man had not been convicted of any crime, but it was suggested that the image portrayed a more sinister character.

The head of the Australian Consolidated Press photography department, Neville Waller, said digital photography was an inevitable part of the future of publishing. He said that photographers had been manipulating images for many years, but that it used to be more clumsy. "It was even possible when I was growing up. Lies were going on in those days too."

He added that there were many instances when manipulation was used innocently. If you take a shot of a silver kettle you can get rid of the reflection of the photographer, he said. "The problems arise when you add information or take out important information. It opens up a can of worms."

"But it is part of progress, part of the trade-off. Photos can no longer be taken as fact."

Selina Mitchell



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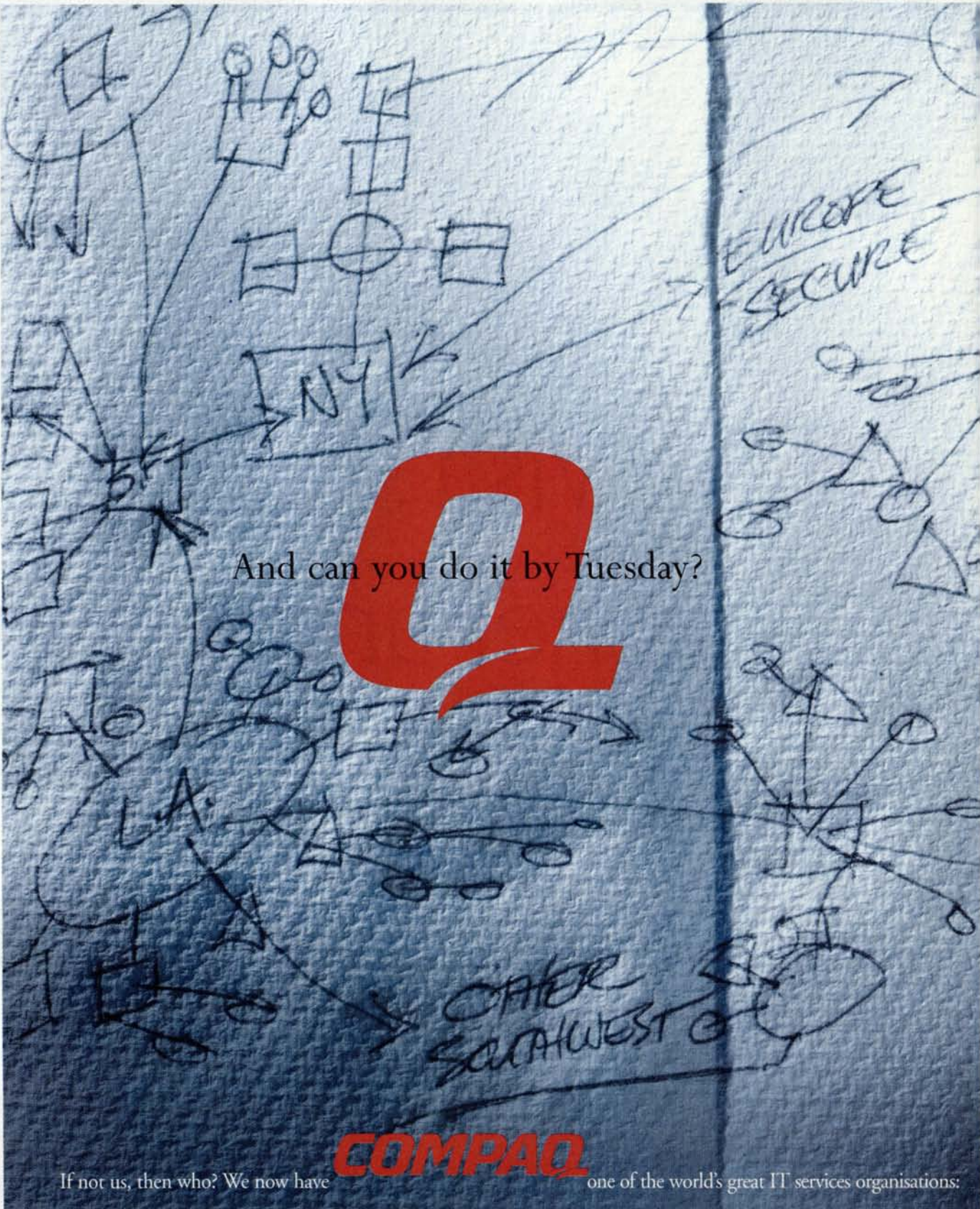
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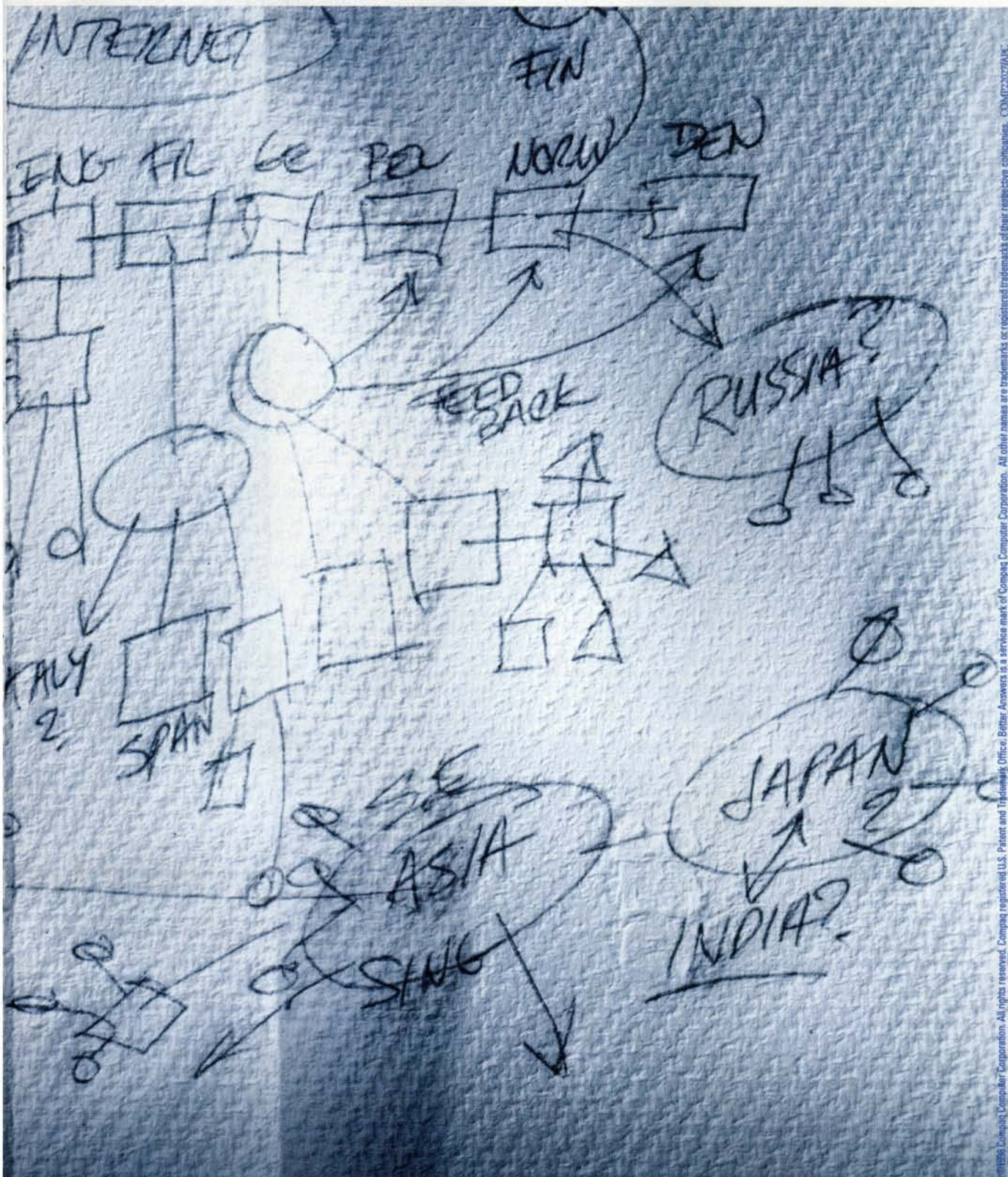
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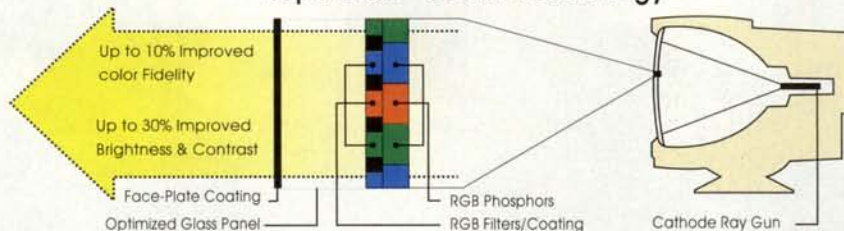
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Applied Technology	---	SuperClear™	SuperClear™	SuperClear™	SuperClear™	SuperClear™
Dot Pitch	0.27mm	0.26mm	0.25mm	0.27mm	0.25mm	0.25mm
Max. Resolution	1280x1024	1280x1024	1600x1200	1280x1024	1600x1200	1800x1440
Recommended Resolution	1024x768@ 87Hz	1024x768@ 87Hz	1280x1024@ 88Hz	1024x768@ 87Hz	1600x1200@ 76Hz	1800x1440@ 76Hz
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With our young IT startups struggling for investment and mindshare in the global marketplace, should Australia look to biotech rather than infotech?

Banking

on biotech

By Dan Tebbutt

Australians are enthusiastic adopters of the latest and greatest computing and telecommunications toys that land on our shores. But this technology fascination has created an enormous balance of payments shortfall, and our talented young IT&T sector is finding it hard to make it onto the world stage in this hypercompetitive industry. Arguably, it may already be too late for Australia's IT industry to become a serious player.

Instead of playing catch-up in the current technology industry, Australia might be better served anticipating the next revolution, according to investment banker and computer science theorist Nick Birrell. He believes Australia is well placed to become a major force in biotechnology, the emerging industry that unites medicine, genetics and information technology — but only if we start exploiting our advantages.

Australia has the scientific foundation for a biotech sector strong enough to ensure the country's future prosperity, Birrell says. Yet our unfavourable tax and investment climate, timid corporate culture and meddling governments are preventing Australia from making the most of its potential. "If government [has some vision and] provides a suitable policy environment, and business [grasps] the opportunity, Australia has the opportunity to be at the centre of 'Genome Valley', the 21st century equivalent of today's icon of successful technological development, Silicon Valley," Birrell wrote in a discussion paper earlier this year.

Birrell's appreciation of Australia's strengths and shortcomings is more than theoretical. As chief executive of County Investment Management, a Melbourne-based superannuation and investment house with over \$9 billion in funds under management, Birrell is at the forefront of economic thinking in this country. He is highly aware of the handsome rewards

available to successful high-technology financiers, yet his prudence demands a circumspect attitude towards local capital investment. Several potential biotech investment opportunities were recently put on hold because of Australia's tax laws, according to Birrell. "The Australian tax laws have become so discouraging, so complicated and seemingly so unreasonable, that the easiest way to undertake the project would be to ship the biotechnology researchers to the United States and to raise the funds there.

"Any development based in Australia was only likely to be a clear winner for the lawyers," Birrell told ABC Radio National in August.

From infotech to biotech

Birrell has not entirely abandoned Australia's computer industry, but he does see continuing difficulties. "It would be very brave to say Australia has missed the boat completely, because it's still early days for IT," he told APC. "The problem is that so much momentum in that field has been established in other countries, particularly the US. It's quite difficult now for Australia to catch up, given that we didn't have an ideal climate for the emergence of major IT companies."

Government initiatives to stimulate IT production are admirable, he says, but they've come 40 years too late to capture the most valuable markets. "I see biotech as being at the stage that the IT industry was about 30 or 40 years ago. We've still got a big chance with biotech, even though it's probably going to move a lot faster than IT because of general technological advance," he said.

"Rather than playing catch-up in IT, there is a chance to leap onto the very rapidly moving biotech train at this very early stage and be carried along with it."

Local biotech research is among the best available, providing a solid footing for

a new technology industry, in Birrell's assessment. "What made the US the current leader in IT was the research base of the space race and the arms race that created the IT research infrastructure and led to industrialisation. We are at that critical level with biotech and related research because of a historic legacy which has been quite positive in biotech rather than IT."

Two factors back our strong position. The first is Australia's leadership in medical science, where our boffins have enjoyed disproportionate success. "We have a longstanding tradition of excellence in medical research. There has been enormous support for medical research in Australia and Australians have done well at it," he said. "Even if it is just historical accident, we should play to that strength." The second area where we excel is agricultural bioscience. Birrell attributes this to

... would even try developing a startup into a major company in Australia rather than go to the US," he said. "Without even talking about stimulatory factors, there is a clear disincentive to invest in Australian long-term investments versus US ones. That needs to be removed."

Birrell believes there would be a case for even greater investment in research if it produced commercial results. "It's a very important goal for the government to foster basic science," he said. "At the moment there are so many roadblocks to commercialisation that you could see why the government wouldn't pour more money into fundamental science."

Industry's inability to capitalise on public investment in research highlights another dilemma. "The Australian corporate sector has a very weak appetite for taking on developmental risk in technol-

locally is about \$85,000. "Our intellectual capital has been severely mispriced."

Building Genome Valley

If we address these problems soon enough, Birrell sees a real chance to seize a leading position in biotech. Already, one ambitious Sydney startup has hired an experienced US executive to lead its charge to market, and Birrell says moves like this will expand local skills and opportunities. Medium-size companies like Amrad and the privatised Commonwealth Serum Laboratories (CSL) show great promise, although research potential already outstrips their capacity to commercialise. "You can't point to two Australian IT companies that might be future Microsofts, but you could say Amrad or CSL might be major transnational bio-pharmaceutical companies," Birrell said.

While drug creation and agriculture present obvious opportunities, Birrell believes the biggest openings in biotech will emerge as genetic technologies find general-purpose application, mirroring the computer industry's expansion as IT became central to many aspects of human endeavour. "Just as it was impossible to imagine the Windows operating system 30 years ago, things like that will emerge from our understanding of how the genome works. Some pretty inconceivable applications are going to emerge from understanding that the human body is like a giant computer with a very large and complex program inside."

Birrell expects the economy of the future will consist of infotech and biotech in equal measure, so it's vital that Australia capitalises on the wide open spaces still available in the biotech industry. Government must continue supporting fundamental science while removing roadblocks to private sector investment, in his opinion. "There is a role for government to stimulate development of future-seeking industries — particularly in this area of biotech, where with an aging population we face an enormous balance of payments deficit in biotech products," he said.

"The future is very much one of trade in information and biotechnologically engineered products. Unless we are contributing something on the other side of the balance sheet, we are going to try to pay for these products by digging stuff out of the ground," he said.

"We need people to take the biotech ideas that are coming out of research labs around the country and turn them into commercial winners." ■

"There is a chance to leap onto the very rapidly moving biotech train at a very early stage."

the country's longstanding reliance on primary industry exports and strong government support for research in this field.

Despite these twin strengths, however, Australia has not made a good fist of commercialisation. The fruit of much Australian labour and investment ends up overseas. As an example, Birrell points to the medicinal drugs granulocyte colony stimulating factor (G-CSF), which were first developed in Australia before US companies took them to market. "It's now a multibillion dollar per year revenue product for a number of multinational drug companies," lamented Birrell.

"Australian investors and Australian society are missing out on the benefits of our world-class intellectual capital."

Tackling the problems

The local research climate is hindered by a difficult mix of government, business and cultural factors, according to Birrell. While federal funding has been instrumental in supporting research, other government policies operate at cross-purposes. "The tax system in Australia is a major hindrance," said Birrell, suggesting the government needs to remove obstacles to investment such as a capital gains regime that does not discriminate between short-term speculation and longer-term support for R&D.

"I can't imagine why any entrepreneur

ogy fields," said Birrell. He contrasts the fortunes of local entrepreneurs in IT and biotech against the extraordinary support for risky minerals ventures. "The odds are probably about the same or better in some areas of IT and bioscience. It really boils down to the lack of sophistication of Australian management."

But he also feels the small size of the domestic capital market makes it hard to adequately balance high-return risks against safer bets. "In Australia it is very difficult to get a widely diversified portfolio because there just aren't enough opportunities," he explained. "In the US it is so easy to ... put together a successful diversified portfolio."

"Maybe the answer is not to take too parochial a view and say we will get a diversified portfolio of venture capital-type investments by investing globally — so on the size of economies, only about 2% of investments are likely to be Australian. To be too unrealistic about what I can get out of Australia will just lead to disappointment."

At the moment, however, Australian ideas and people are fleeing offshore to find supportive developers. "There is a danger if we can't move fundamental research forward, we will lose those skills overseas," said Birrell. Generous government and industry backing means biomedical researchers can earn up to \$250,000 in the US, while the top level



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Phone talk

By Selina Mitchell and Simon Vandore

If industry predictions prove true, we will soon be using our mobile phones for much more than talking.

Voice will become just one option in the multimedia-enabled mobile communications devices of the near future. We may even have both good-quality national service coverage and a reliable global mobile telephony service — but don't hold your breath.

Technologies for the convergence of high-speed data services and voice are on the way. So are new players in the market which, it is hoped, will provide competition and the long-awaited reductions in costs for voice calls. The newer technologies and services will initially be expensive — and to benefit from the expected incremental enhancements to digital networks, you may have to keep purchasing new handsets.

Mobile phones are relatively expensive, intrusive, omnipresent (in all the wrong, as well as the right, places) — and we love 'em. However, we sigh each time the thing rings in the supermarket, and as we show off the features and colour of the latest purchase to friends and colleagues, we can't help mentioning the lack of coverage and the expense of it all.

Our feverish take-up of mobile services is well noted, and explained by a love of technology and mobility. This \$3.7 billion-a-year industry has captured the hearts, minds and pockets of one-third of Australians, and the penetration rate for mobile phone use is expected to reach well over 40% by 2000, according to telecommunications analyst Paul Budde. Nokia predicts that by 2000, half of the population will have a mobile phone.

By June this year, about 5.3 million Australians had subscribed to a mobile phone service, according to Australian Communications Authority

Bluetooth offers new connections

Connecting portable electronic devices today requires a confusing array of proprietary cables. In the near future, a consortium comprising IBM, Intel, Nokia, Ericsson and Toshiba hopes to eradicate the rat's nest of cables with a universal wireless link technology called Bluetooth.

Bluetooth allows short-range (up to 10m) radio-frequency connections at speeds up to 700Kbps, between devices such as PCs, phones, digital cameras, PDAs, faxes, keyboards, pagers and joysticks. Its inherent flexibility means Bluetooth can be used as a peripheral interface, a bridge to existing data networks, or a peer-to-peer technology for ad hoc communication between groups of devices.

Operating in the unlicensed ISM band at 2.4GHz, Bluetooth uses a time-division scheme for

full-duplex links that combine features of packet and circuit-switching. Unlike infra-red, it does not require a clear line-of-sight, and a frequency-hopping scheme allows Bluetooth radio devices to operate in a noisy environment with minimal interference. Each packet is transmitted at a different hop frequency, and slots can be reserved for syn-

chronous packets to support 64Kbps voice channels. Further technical details are online at <http://www.bluetooth.com/techn/overview/index.asp>.

Ericsson's mobile phone marketing manager, Paula Callenbach, claimed Bluetooth would bypass bulky integrated devices like the Nokia Communicator. She said most customers want the smallest possible handset and are happy with "split solutions", so long as they can work with their laptop and PDA via infra-red or Bluetooth. "Once you've got Bluetooth, why in the world would you want a Communicator? Why would you want to carry around a big clunky thing? Bluetooth really supersedes it," she said.

Colleen Wade of Optus agreed Bluetooth was important, but she said Optus was still trying to understand its value from the carrier perspective. When combined with a spontaneous networking technology like Sun's Java-based Jini, the range of potential applications is enormous. As an example, Mark Leatham from Sharp outlined a new way to send digital postcards. Tourists could snap a photo on their digital camera and transmit it to their GSM phone via Bluetooth; on the phone they could add an email greeting and instantly send the image via the mobile network.

Dan Tebbutt

(ACA) figures. There are, on average, 16,000 new digital connections per week, and we make 2.1 billion calls per year, Budde said.

Mobile telephony is one of the fastest growing telecommunications sectors in Australia, he said. There has been a 65% increase in the market since its introduction. While recent years have seen 25% growth, this year it will probably be around 15% said Daniel Baker, an analyst with Ovum. The residential market is now the fastest growing segment, making up 80% of new connections. The two major players in the market, particularly Optus, are relying on this rapid growth to help prop up total revenues (Budde said 46% of Optus's total revenue comes from mobile services). One analyst suggested that the \$6 billion cost of setting up infrastructure is being recouped at a pace that would make many entrepreneurs blush.

A bit of history

Australia presently has two different technologies behind its mobile telephony services. The first network was launched in 1987, when Telstra began a first-generation analog Advanced Mobile Phone System (AMPS) service. Initially analog phones cost about \$5,500 and \$600 per year for access, said Warren Duncan, manager of the ACA's analog closure public education program.

Take-up rates for phones were not high when services first commenced, said Baker. Mobile phone ownership did not become very popular until the early 1990s. Handsets were bulky and the coverage was mediocre, he said, adding that it took time to build up the infrastructure. "The first handset I ever had was as big as two or three house bricks."

The \$6 billion cost of setting up mobile phone infrastructure is being recouped at a pace that would make many entrepreneurs blush.



In 1988, the Federal Labor Government established AUSTEL (the telecommunications watchdog which has now, in part, been replaced by the ACA). The organisation was asked to report on the possibility of licensing additional mobile phone service operators, using the same or another available technology: the sector needed competition, the Government said.

In 1990, AUSTEL recommended that three operators be licensed to provide a service based on the second-generation digital Global System for Mobiles (GSM) technology. After industry and community consultation, AUSTEL's standards advisory committee gave unanimous support for the adoption of GSM, Duncan said.

The analog network was to be fully replaced by digital services, as it was believed Telstra would have an advantage if it was allowed to keep its existing network. This would not encourage the new entrants to build their own competing networks. In November 1991, licences were given to Telstra and Optus to commence service in the second half of 1993.

The Government then issued the 900MHz band plan as a regulation under the Radio Communications Act of 1983. This indicated that the phase-out of the analog spectrum would be completed by January 1, 2000. Later, Vodafone purchased the third mobile phone licence for the 900MHz GSM spectrum, to start operations at the same time as its competitors. Optus decided to operate an AMPS network reselling Telstra capacity; Vodafone decided not to.

By the end of 1993, there were two alternatives for analog service provision, and three new digital carriers. Initially prices were high (GSM handsets cost about \$1,000 in 1993, for example), but the popularity of the services grew. There were 2 million subscribers by June 1995, and 4 million by December 1996. Eight months later, a total of 5 million Australians had subscribed. By this time publicity on the closure of the analog network had increased, and the number of digi-

replacement with GSM services has worried many groups located outside the main metropolitan areas, including agricultural, tourist, transport and fishing industries, emergency services, local and state government agencies, and small businesses. Individuals, who have found that digital services are inferior to those supplied by the analog network, are also concerned.

The majority of the Australian population lives in cities, where digital has been easier and cheaper to implement, and where the analog shutdown began some time ago. Obviously, Australian cities tend to dictate models for how the whole nation adopts technology, often

creating unfortunate side effects, such as inequality of Internet access between rural and metropolitan areas. Mobile carriers often make impressive claims like "90% of the Australian popu-

lation covered", but one look at a coverage map will tell you this really means that 90% of the population lives in heavily settled areas with base stations.

Digital services are adequate in many towns, but travel out 30 or 40km and the service is virtually nonexistent, the National Farmers Federation said. Many of Australia's highways are similarly lacking in coverage. Analog signals travel further than GSM signals, and have therefore provided better coverage, particularly in regional areas. GSM requires more base stations than analog to cover the same area. GSM operators have exacerbated the situation by concentrating on improving services in the most densely populated areas to justify the costs of each base station (for a more

Many people in rural and regional areas could not understand why something that worked, was relatively cheap and was well used had to be phased out.

tal subscribers had overtaken analog subscribers. In June of this year, the number of digital subscribers was more than double that of AMPS users.

In the 10 years from 1988, revenue has risen from \$40 million to \$3.7 billion, Budde said. Telstra has the largest total mobile market share at 56.6%, Optus holds 31.7% and Vodafone 11.7% of the market. Revenues for 1997/98 were \$2.1 billion, \$1.3 billion and \$300 million respectively.

A little battle

While there is money to be made in them thar hills, the hills have recently become a battleground. The legislated phase-out of the AMPS network and its

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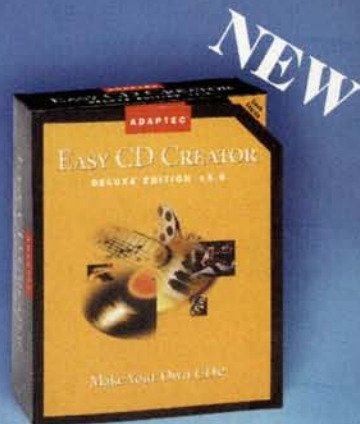
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detailed discussion on the differences between analog and digital, see 'Calls ain't calls', page 81).

Many people in rural and regional areas could not understand why something that worked, was relatively cheap and was well used had to be phased out; for this reason, the quality and universality of the service provided by mobile carriers became a hotly discussed issue in the lead-up to the federal election.

The Federal Liberal Government was locked into the closure of the network, which had been written into the digital licence agreement its predecessors had signed with Vodafone in 1992 — the GSM licences were distributed on the understanding that the analog network would be phased out and the customer base would migrate to digital. Optus and Vodafone had built their multi-billion-dollar networks on the guarantee of the shutdown. Government legal advice suggested the retention of the AMPS network in regional Australia depended on the voluntary consent of the carriers, but rural voters demanded action.

The National Party and APUMP (the Association for the Protection of Users of Mobile Phones, which has strong rural backing) campaigned on the issue with some success. The often fiery APUMP (<http://www.apump.com/>) even organised a van to drive around NSW, testing analog and digital availability, and inevitably found huge deficiencies in the digital coverage.

Reported threats of legal action from incumbent carriers if the analog network stayed were met by Government threats: it announced measures to ensure that rural phone users would receive services broadly equivalent to those currently available in urban areas — even if it had to force infrastructure rollouts. The ACA was asked to review the present AMPS service in areas where there would be no adequate digital coverage after the phase-out, and when the carriers agreed, the AMPS service would remain. The Government would impose extra network rollout obligations to extend alternative coverage, such as GSM, in areas where the carriers did not agree to keep AMPS services.

had significantly greater AMPS coverage. "The differences are significantly greater when individual carrier coverages are considered," according to the report. "No GSM user presently subscribing to one carrier can access the aggregated GSM coverage. Thus the impact of the AMPS-GSM differential is exacerbated."

There were again reported threats of litigation by Vodafone. Then the pressure was eased a little when the Government announced a Telstra decision to introduce a new digital technology across Australia to improve access outside cities — it would use US-based code-division multiple access (CDMA) technology to set up a network that would allow all AMPS-covered areas to receive good digital services, Government ministers said.

Problem solved, sort of . . . The Government had actually jumped the gun. Telstra did buy spectrum at frequency auctions held midyear, with the intention of setting up a second network to commence operation next year, but had not yet decided on

which technology to use. Metropolitan areas would get the service first, while dual-mode phones would allow people in rural areas to use the AMPS network before the phase-out (still to take place by 2000), but no promises had been made on how good the coverage would be. That would depend on trials yet to be completed.

Agreement with the carriers was finally reached just before the election was announced in September. As it was in caretaker mode, the Government announced the agreement as an election



Each GSM base station costs around \$300,000 and four or five would be needed to cover the same area serviced by one analog station.

Forced rollout of GSM services to rural areas by all carriers, which were not interested in setting up roaming arrangements, would have been costly — each GSM base station costs around \$300,000 and four or five would be needed to cover the same area serviced by one analog station.

In the meantime, the ACA's commissioned review was released. It found widespread reliance in rural and regional areas on the additional coverage available from AMPS for business, personal and emergency communications. About 70% of the 123 regional areas analysed

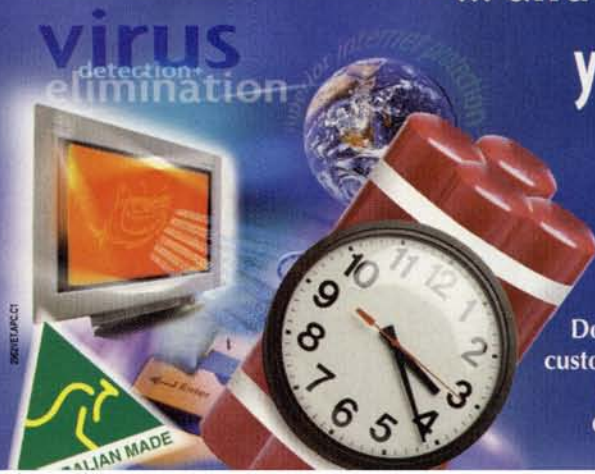
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promise: if re-elected it would introduce a staged phase-out of AMPS in regional Australia to be completed by December 31, 2000, and would "ensure that Telstra upgrades its entire AMPS network to a national digital system (most likely using a new generation Code Division Multiple Access system)". It also announced it would allocate \$25 million over three years to construct about 120 base stations along Australian highways. The project would be funded through the further privatisation of Telstra.

Finally, in mid-October Telstra announced it would indeed use CDMA technology for the network, and that analog services in some rural areas would remain until the end of 2000 to ensure a smooth transition to the new service. So, the analog mobile phone network will close in all metropolitan areas on January 1, 2000, as planned, but coverage in some regional areas will remain for another 12 months, while alternative technologies are established.

Do the shuffle

The present system is by no means perfect. Virtually everyone who owns a mobile phone will have performed the shuffle:

"The bottom line is —"

"Hello?"

"I'm here. The bottom line is"

"Hello?"

"Hang on." (Moves around the room watching for the service bars on the phone to rise.) "Can you hear me now?"

Beep-beep-beep.

"Damn."

This happened several times to APC journalists while working on this story.

As discussed earlier, there are plenty of places outside metropolitan areas where mobile services do not exist, and even in well-covered cities, there are times when calls are hard to make, receive and hear. Known black spots abound — in Sydney these include Glebe, Marrickville, Pyrmont and Annandale. While one service may work perfectly in your home or backyard, a phone using another carrier's network may not even pick up a signal.

Call congestion and call drop-outs are monitored in the ACA's quarterly *Telecommunications Performance Monitoring Bulletin* for both analog and digital networks. The likelihood of call drop-out (the unintended disconnection of calls by the network during conversations, due to signal fading or radio interference, for example) can be influenced by reflections and shadowing

Calls ain't calls

The efficiency of a mobile phone system depends on how it divides up the available spectrum, resulting in the number of possible calls it can carry.

The first mobile phone technology, frequency division multiple access (FDMA), divides available bandwidth into many channels and occupies one for each direction of a conversation. That's how Australia's outgoing analog system works, while GSM (using time division) creates fewer channels, all of a much greater size, but can fit multiple conversations on one channel. Because CDMA uses an entire frequency to carry multiple calls, each with an identifying code that is used by a phone to track down accompanying packets, it doesn't really have channels as such, and is therefore a more efficient digital standard. Almost every company admits CDMA is the long-term answer, but current developments in Australia are almost entirely staked on GSM.

"[CDMA] is good for telecommunications companies because they can pay less at a spectrum auction for a small quantity of frequencies, and still have lots of capacity to handle many conversations," wrote Phill Bertolus, who comments on Australian mobile phone developments at <http://www.webwombat.com.au/>.

Digital is clearly better than analog in that it's more accurate. Everyone is now familiar with the difference in accuracy between twisting the tuning dial on a traditional radio, and pushing the tuning buttons on a modern digital set. Shortwave listeners in particular learn this when they're trying to keep track of Radio Moscow or Voice of America. The

same kind of difference exists between voice calls carried using analog technology and those which exist as digital data — analog wastefully requires that a little space be left between each channel, while digital's greater accuracy means you can place more strain on the bandwidth without causing chaos. Improvements in computer technology make it possible to refine digital techniques and get even more from allocated bandwidth.

On the other hand, it's important to realise that neither digital nor analog mobile phones are wireless over significant distances such as those of CB radio or shortwave. Both require a great deal of physical infrastructure, such as the base stations and physical wiring connecting them to everything else. During floods in NSW's Central West earlier this year, users discovered the vulnerability of Telstra's MobileNet services when water damaged underground cables meant to carry 'wireless' phone calls.

Digital's improved accuracy and efficiency formed the rationale behind its replacement of AMPS, though unfortunately the limited range of GSM transmitters (around 35km, as opposed to analog's potential 150km) means that it's proved far more expensive to implement GSM across wide distances such as those in rural Australia, where people have learnt to stick with analog. For this reason, some disgruntled users see the GSM decision as a major mistake made by the Australian government, especially as it is bound by legislation.

Simon Vandore

from physical features such as high-rise buildings, the size of the customer base at any particular time in a mobile service area, and by some aspects of customer usage of mobile equipment, the report said. Call congestion within a mobile network may occur when a call from a mobile phone cannot be set up, because all mobile radio channels serving the area are in use.

AMPS customers using either Telstra or Optus receive the same quality network service (they use the same infrastructure) and experience the same coverage in a particular area. Analog call drop-outs averaged 3.1% nationally (highest in the ACT at over 4%) and call congestion averaged 1.3%. GSM congestion was below

0.5% in all states, but call drop-outs varied across the states and territories and the carriers. In the ACT, for example, rates were: Optus 2.11%, Telstra 1.39% and Vodafone 1.23%. In NSW, rates were Optus 1.78%, Telstra 2.16% and Vodafone 1.88%.

The ACA states that telephone users are entitled to "reasonable access" to fixed telephone services, under provisions of the *Telecommunications Act 1997*; however, this condition does not apply to the provision of mobile phone services. "All decisions on the placement of base stations (towers) in order to provide mobile phone coverage are made by mobile phone carriers on a commercial basis."

The carriers are constantly increasing base station numbers, but it is an expensive process. Allan Horsley, managing director of the Australian Telecommunications Users Group (ATUG), said that while a base station in a capital city's CBD will pay for itself in six months, one on the road between Goulburn and Bowral will not. Optus announced it would spend \$300 million in the 12 months to August next year upgrading its digital network with 600 new base stations. Telstra has said it spends that much every year improving coverage. For example, it now has small transmitters at every Melbourne CBD intersection.

Horsley said it is relatively expensive to own and use a mobile phone in Australia, particularly if you subscribe to digital services. Budde said that although the mobile growth trend for 1998 is down on previous years, without new competition, the three operators have been able to keep their revenues up. Growth will increase through new services and competition, but this year at least, the three incumbent operators should expect to see an increase in revenue of around 15%, more than double that of the previous year, he said.

Average revenue per user has stayed relatively high at around \$700 to \$800. "We had estimated that by 1998 this would have dropped to around \$650 to \$700," Budde said. "The triopoly has been able to keep mobile charges artificially high, and without the immediate threat of more competition and no interference from the regulator, the three operators are raking in the profits."

Budde describes wireless communication as the 'saviour' of carriers around the world, which are all seeing their fat profit margins in the fixed networks decline due to competition. However, revenues from straight mobile services are now also flattening out. The current 'saviour' is the

fixed-to-mobile calls generating \$1 billion in extra revenue for the incumbent players. This is keeping profit margins in the wireless market at a very high level, he said.

Horsley noted that it costs more to call a mobile out on the street (from another mobile) than it does to call London. Many businesses are setting up fixed mobile-to-PABX services so they don't have to call mobile-to-mobile, he said. The Australian Competition and Consumer Commission is currently undertaking a public inquiry into mobile-to-fixed services, which should be completed before the new networks begin operations.

And then along came . . .

As explained earlier, the closure of the analog network, intended to create competition for GSM digital services, has itself

Although the mobile growth trend for 1998 is down on previous years, without new competition, the three operators have been able to keep their revenues up.

set the scene for more competition and extra network infrastructures, using a number of technologies in Australia. The 800MHz spectrum, sold at auction by the ACA midyear, was bought by a number of new players.

Almost all of the 1,800MHz spectrum was bought by the three GSM carriers to increase the capacity of their GSM services. As the spectrum was purchased incumbent, they will not be able to fully use it until sometime in 1999. Two other operators — One.Tel and Catapult — emerged. One.Tel announced it would build a GSM network using the 1,800MHz

spectrum it bought in Adelaide, Brisbane, Melbourne, Perth and Sydney. To provide national coverage it will need to seek intercarrier roaming agreements with new or incumbent players. Catapult bought 1,800MHz spectrum in Cairns and South Australia.

The 800MHz sales were dominated by Telstra, which bought spectrum in all areas (to be used for a new CDMA network as outlined earlier), but three new players emerged.

AAPT bought 800MHz spectrum in Adelaide, Brisbane, Albury, Canberra, Darwin, Perth, and Dubbo, as well as regional areas in South Australia, remote NSW and Victoria. It has not announced plans for that spectrum, but rumours suggest it will align itself with another supplier to provide national coverage.

Hutchison has chosen CDMA technology for its network, and plans to establish

services in Sydney and Melbourne on the 800MHz band. Roll-out plans have not been released. OzPhone plans to offer services in the second half of 1999, using CDMA technology.

It holds spectrum licences in Brisbane, Perth, Cairns, Mackay, Maryborough, and Grafton, as well as Tasmania, regional West, remote West and remote Queensland regions.

One commentator has predicted a great infrastructure debacle, with new 1,800MHz services from the three incumbent players and at least one other new operator, and at least two new 800MHz networks. There may also be fights to install new mobile phone towers to service the networks. ATUG's Horsley suggested that perhaps some of the players would join forces or purchase network capacity

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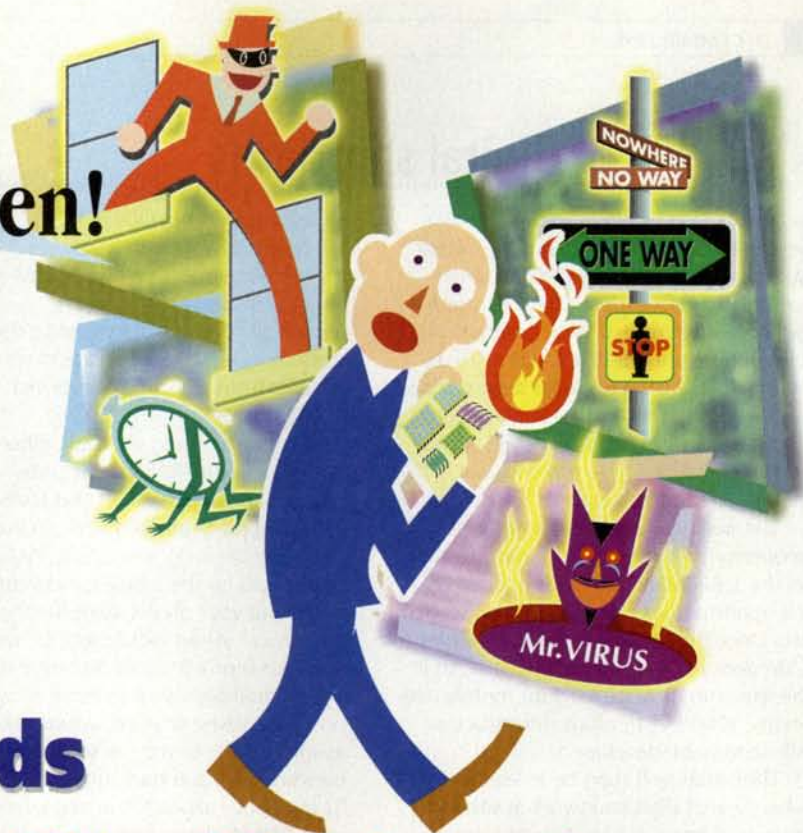
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Mess of digital standards

As technologies improve, more standards are enhanced and devised, but the further we progress, the murkier the standards waters become. In some countries, up to four or five different mobile communications options are available to users. To an extent, Australians have so far been shielded from this confusion, as choices have been restricted to using an analog AMPS service or the GSM digital system. Watch out, though, because this is about to change.

The freeing up of the analog 800MHz frequency, and the sale of it and spectrum on the 1,800MHz band, has opened up the opportunities not only for new service providers, but also for new technologies. GSM does not operate on 800MHz, so if the spectrum is to be used for mobile telephony, a new technology infrastructure will need to be developed.

Thus there will soon be at least one other type of digital network available to users, and possibly two. Satellite systems will also supply a different raft of services. Not all will be backward compatible with earlier technologies, or even compatible with each other. Confused?

The first mobile services provided in Australia were supplied by the analog-based Advanced Mobile Phone System (AMPS) using the 800MHz band. The second-generation digital technology, Global System for Mobiles (GSM), was chosen to replace analog in the early 1990s. Three carriers (Telstra, Optus and Vodafone) began using their separate 900MHz GSM networks in 1993.

GSM was, and still is, the most established of the digital network technologies. The Australian Communications Authority reported that at the end of 1997, there were 233 operational GSM networks, with more than 66 million customers in over 110 countries. It estimates there will be 205 million GSM customers worldwide by 2000.

However, other second-generation technologies are competing with GSM across the globe, predominantly code-division multiple access (CDMA) and digital AMPS (D-AMPS). These technologies use the 800MHz spectrum that was sold in spectrum auctions earlier this year.

There are about 9.2 million D-AMPS users world wide, and 10 million CDMA subscribers (although around 8 million of them are in the closed South Korean market). Australia would provide an important foothold for either or both technologies,

increasing the coverage of the selected standard and increasing the winning group's global roaming capabilities. Most analysts agreed all of the systems work, and work well — it is more a case of *who* benefits from the use of *which* technology.

It's worth noting the basic differences between TDMA and CDMA-based technologies. GSM and D-AMPS allocate a piece of bandwidth to each call (time division), whereas CDMA carries all calls on the whole bandwidth at once, and your phone identifies the pieces of your call via an initial piece of data (code division). In more technical terms, TDMA multiplexes up to three conversations per 30kHz channel, whereas CDMA assigns a code to the packets making up a conversation, and transmits everything on its frequency allocation at once. In this way, CDMA allows carriers to fit several times more calls on their available bandwidth, while increasing reception quality.

TDMA's transmission method can interfere with other radio devices (Australia has also seen some overlap between AMPS and GSM frequencies) and it is inefficient with power — the radiation produced allegedly causes brain tumours. CDMA is more power-efficient and has a greater range, so it is usually favoured by independent experts. However, communications columnist Stewart Fist reported in *The Australian* on September 22 (page 61), that while his experience of CDMA call quality was always good, he "noticed a clipping of incoming words on the handset as the base station's transmitter power changed to reduce radio noise".

Telstra, Hutchison and OzPhone have all decided to use CDMA for their 800MHz networks. These networks will not replace GSM, although it is predicted that the new competition will force down prices. All three GSM carriers are publicly committed to GSM, and recently bought spectrum in the 1,800MHz band to bolster capacity (GSM also operates on this frequency, but dual-mode phones are needed to take advantage of both frequencies). Suppliers Nokia and Ericsson have also stated their support for the long-term future of GSM. Most industry analysts agree GSM will be a dominant player for the next five to 10 years, due to its dominance in the global market. Enhancements are also planned for the technology which proponents say will



virtually counter the need for a third-generation technology, at least for a few years.

But just in case, most GSM supporters are working on their third-generation technology and pushing it as the best option before the International Telecommunications Union. Wideband CDMA (W-CDMA; no relation to the US second-generation CDMA) is the

preferred option for GSM and D-AMPS proponents, including Japan, Europe, some of the US, and other parts of Asia. The CDMA Development Group was working with the ITU to merge its vision of third-generation mobile services, called cdma2000, with W-CDMA so it would not be orphaned when new services eventually commence.

It seems a number of proposals will end up before the ITU, and it is not expected that one standard will eventuate. One Nokia commentator suggested there was hope for agreement on one standard, but it would have to be the one they wanted. As is often the case, no-one appears to be waiting for the standards process to be completed. W-CDMA is already being trialled, and expected to be in operation in Japan in a few years. Not surprisingly, new handsets and infrastructure will be needed to enjoy the benefits of third-generation technology.

"Evolutionary steps need to be taken to get there, and each step or change requires the customer to purchase a new handset," said Greg Young, new business manager for Telstra mobiles. "It's a bit like the IT industry: each time you get new software, you have to throw out the old hardware."

Arguably, the most lucrative business in the sector will be selling dual-mode and dual-frequency phones, as it will become increasingly necessary to accommodate the different infrastructures within and between countries. Ericsson is working on a World Phone which will handle GSM, AMPS and D-AMPS across five frequencies (but not CDMA). Nokia recently launched its 6150 phone, which covers the 900MHz and 1,800MHz GSM bands.

For a closer look at the major differences between the technologies, see

apcmag.com.

Selina Mitchell and Simon Vandore

from Telstra (he said it is probably essential to providing an adequate service). He said that Optus' reselling of Telstra's analog services proved it was possible to have resale and strong competition without replicated infrastructure. New players may also decide to set up an east-coast network before going national, but services offering coverage in only a few states or cities may not appeal to Australians, who love to travel, said Horsley.

There has been fierce competition between infrastructure providers to supply networks, and it has been suggested that airtime and handset prices will crash as a result. This will in turn result in lower costs for GSM services as the competition heats up, Horsley said. That will probably also mean fewer opportunities to make money from the services, analysts suggest. Even as we write, more network services and technologies are being developed and trialled. Satellite services are but one example. Australia is in for some mean competition and perhaps a glut of mobile service offerings.

The next generation

A great deal of mobile phone industry hype currently relates to the 'third generation' or 3G, collectively referred to as IMT-2000 by the International Telecommunications Union. Like everything else in this field, IMT-2000 has alternative names — Universal Mobile Telecommunications Services (UMTS) and Future Public Land Mobile Telecommunications Service (FPLMTS). Telstra was directly involved with IMT-2000 for some time, but the Cooperative Research Centre for Broadband Telecommunications and Networking (CRC-BTN) at the Curtin University of Technology notes that Telstra's intentions are now less clear. CRC-BTN is running its own research project into 3G multimedia in cooperation with Australian industry.

The extension of GSM using EDGE (Evolved Data Rates for GSM Evolution) and of D-AMPS to IS-136 HS in a similar fashion, will create the potential for data rates of up to 384Kbps. This is often spo-

ken of in relation to 3G services, but it's really just an extension of the second generation. The companies behind D-AMPS and GSM are pushing a 3G proposal called wideband CDMA (W-CDMA), which has the potential to provide speeds of up to 2Mbps.

After getting the nod from the influential European Telecommunications Standards Institute (ETSI), the hype is centred on W-CDMA. Built on top of time division multiple access (TDMA) networks, W-CDMA is not backward compatible with CDMA, but does provide a migration path from GSM and D-AMPS; it will require users to purchase new handsets. The major 3G rival internationally is Qualcomm, inventor of CDMA, which has come up with cdma2000 (also known as Wideband cdmaOne). It is backwardly compatible with CDMA, the most advanced 2G technology, but Qualcomm's interest in it means almost every one of its competitors (Nokia, Ericsson and Motorola, to name a few) remains behind W-CDMA.

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Turn of the page

Mobile pagers have been around even longer than mobile phones. Depending on your perspective, a beeping, flashing, and/or vibrating pocket pager is either an excellent business tool, or just another social scourge. While pagers don't boast the sheer popularity of mobile phones, they remain in widespread use, and the major Australian networks run by Hutchison Telecommunications and Link Telecommunications (which is the process of taking over Telstra's paging business) are pretty familiar to most. Advertising campaigns have recently tried to target users outside the traditional business market, for instance marketing pagers to teenagers as a way to locate their friends.

Paging traditionally uses variants of POCSAG (the Post Office Code Standardisation Advisory Group protocol, developed in the UK) and newer backward-compatible protocols, such as Motorola's FLEX, at speeds which have increased over the years from 512bps to 6,400bps, and are now able to handle alphanumeric data, as opposed to older tone and numeric systems (the cheaper numeric pagers simply display phone numbers and codes to indicate the type of message).

Paging networks use lower frequencies than mobile phone systems, resulting in better penetration (longer range) and less signal corruption. However, paging is more like sending email than making a phone call, because transmissions are queued — messages are sent quickly, but not instantaneously, meaning it's quite inefficient to use this technology to hold a conversation. But as a communication device to which users can respond in their own time, it's still faster than email. In fact, both Link (<http://lens.link.com.au/pfw/>) and Hutchison (<http://www.hutch.com.au/page.html>) have Web forms which make it possible to send an instant message to someone's pager.

With the emergence of higher-quality, higher-bandwidth mobile phone networks that support new short messaging, paging and data functions, you might think the days of traditional paging networks are numbered. Indeed, all the major pager manufacturers are also mobile phone makers, but for the moment, paging is a cheaper way of broadcasting a basic message to multiple receivers, or to a single person. Value-added services are as

critical here as with telephones — for example, faster paging technology makes possible applications such as Hutchison's Newspaper service, which delivers information from global stock exchanges and financial markets with a delay of only five to 10 seconds.

Clock this

One of the most interesting new uses of the paging network to emerge this year was the TeleChron clock, developed in Melbourne by HPM Technologies. It was inspired by railway platform clocks in Germany which tick in unison and are kept up-to-date via radio frequency transmissions, a system which is simply too expensive in Australia. Searching for a way to create clocks that were accurate to within 250ms without physically wiring them back to a base, HPM discovered it could get around the problem of queues in paging systems.

When time signals are to be transmitted, a 'mark' signal is sent first, causing each clock to begin a count until it receives a second

signal containing the exact time that the mark signal was received. This is possible because the broadcast nature of paging means that HPM's control centre receives the mark signal at precisely the same moment as the clocks. Each clock then sets itself according to this information.

Melbourne Airport is now using HPM's basic analog wall clocks, and they have proven popular with radio stations for use in outside broadcast vans. A sophisticated-looking \$2,500 boardroom model called the Slattery Clock is in production, while HPM said it has an export deal in the works. The technology will work with any POCSAG network, but is limited to above-ground use (unless a paging

retransmitter is installed underground) and will not suit some forms of transport, such as ships which range beyond coastal areas.

The technology has also proved transferable to electronic signs (for use by stock exchanges, and foreign exchange rate boards at airports) and HPM Technologies sales director Roger La Salle said plans are under way to use it for remote reading of power meters, and in a clock that will also display up-to-date weather forecasts.

Simon Vandore



HPM Technologies' upmarket Slattery clock uses paging signals to maintain accuracy to within 250ms.

Both W-CDMA and cdma2000 will probably gain some market share, meaning interoperability will be important for the success of wideband services — not only within specific countries, but on an international scale. So Qualcomm has presented ETSI with a set of "fairness principles", within which interoperabil-

ity between W-CDMA and cdma2000 is a key point.

At the moment, hype for 3G is centred around possibilities. For example, Ericsson is promoting its vision of a "wireless terminal that's your gateway into the world of voice, data, video, mobile Internet and multimedia communications". The

artist's impression of this device is a sleek, white, buttonless capsule that looks a bit like an electric shaver. The idea is that everyone will carry one around and it will serve transparently as a single point of communication for voice and data, with wireless communication between it and other devices. In a single hour it might

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Generation gap

Plans for 3G handsets include the ability to make and receive multiple calls at the same time (for data, voice and video): users should be able to simultaneously receive a fax, download email, serve files and run a videoconferencing call. Value-added multimedia content will be key, whether from the Internet or controlled by the network operator, as it is anticipated 3G consumers will want to do more than simply make voice calls.

The major requirement for 3G applications (and some upcoming 2G developments) is increased bandwidth, gained through combining channels — for example, a standard CDMA channel offers 14.4Kbps, but a carrier could potentially offer ISDN-level speeds for video by aggregating these channels into a single higher-bandwidth call. W-CDMA proponents are talking about data rates as fast as 2Mbps. Trouble is, every carrier's bandwidth is finite — even though 3G technologies should use bandwidth more efficiently, there has to be some additional cost. Either charges will be based on the bandwidth used, or the standard maximum bandwidth for a call will need to be lower than current speculation suggests.

"If it occupies the space of voice, there is a question as to how affordable it will be," said Greg Young, new business manager for Telstra Mobiles. "At present, the voice coding is around 8 to 10Kbps, 13 to 14Kbps. Data speeds of 184 to 300Kbps — that's 10 times the bandwidth! There are serious questions to be addressed about affordability of delivery... [The] third generation will be there for those that want to pay more."

Functioning 3G prototypes exist, and Japan looks to be heading for the first real implementations of W-CDMA. Chris Isaac of the CRC-BTN saw Japan as the most likely place for interoperability between W-CDMA and cdma2000 to be developed. Elsewhere, an interim wave of 2G developments is likely to hit the market first — for example, phones that double as personal digital assistants (PDAs), like Sharp's MC-G1 (basically a phone with an advanced organiser built in) and Qualcomm's pdQ 'smartphone' (a dual-mode phone sold in the US, which is also a fully functioning PalmPilot). Ericsson has predicted that GSM users will have access to GPRS (general packet radio service) by 1999, a software-based technology which provides packet-based data rates of 115Kbps — quite a leap from the current 9,600bps. Even the current generation is being used in new ways for data, through Telstra's current pilot program in Melbourne, for example, which offers low-bandwidth Internet access via MobileNet digital.

"There's still a long way to go with second-generation technologies," said the ACA's Grant Symons. "It will be a long time before we're really onto third generation." He pointed to recent spectrum auctions and the entrance of new carriers to the market, predicting that we would soon see ISDN-level wireless speeds. By the time of the Sydney Olympics, where Samsung will be the official mobile phone supplier, Symons expects Australia will still be dominated by GSM with perhaps a bit of CDMA uptake — overseas visitors, Americans in particular, will probably bring dual-mode AMPS/CDMA handsets and be able to use CDMA global roaming, while new technology in the 1,800MHz spectrum could allow GSM roaming.

Which is not to say that some Americans aren't already impressed with

the way GSM — Australia's digital system — works. At the Citrix Thinergy conference in Florida last September, US Citrix officials, accustomed to the vagaries of the US AMPS network, spoke of being stunned when, while visiting Europe, they witnessed a colleague demonstrate their remote WinFrame thin client technology to a customer by simply whipping out a GSM mobile phone and dialling the office.

Australia's third mobile phone network, run by Vodafone, is perhaps the most clearly committed to GSM, but its parent company has run tests in the US with Qualcomm that show it is feasible to put CDMA on a GSM network. This potentially leaves the future wide open, despite Australia's official GSM commitments.

Loops and teeth

Another technology we're likely to see implemented in Australia before 3G takes hold is wireless local loop (WLL): the use of mobile phone technology to bypass, complement, or take the place of traditional copper telephone wiring (wireline loop). It's logical that countries looking to improve their communications infrastructure will adopt this cost-effective and aesthetically pleasing method, but it's also a way for new competitors to gain access to local call markets dominated by large, established companies like Telstra and Optus. New carriers in the UK have already used microwave transmissions to bypass British Telecom's traditional local loops, but the predicted interest of Australia's new carriers in radio-frequency WLL has yet to show itself.

Phone companies like to predict that countries in Asia, Africa and Latin America, which don't currently have good telecommunications infrastructure, may move straight to wireless local loop, or

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Information skyway

Internet access for rural and regional Australia was the dominant IT&T theme in the recent federal election. At the previous poll, the Coalition campaigned to make ISDN services a national entitlement, but this pledge was dropped in August when the Australian Communications Authority concluded that satellite Internet services would be more cost-effective. Experts such as Cisco chief technology officer Judy Estrin quickly questioned the faith in data from above. "It's not a technology you can rely on in the next two to three years," she told a networking conference.

Nonetheless, Telstra pushed ahead with plans for a high-speed satellite service based on DirecPC technology, developed by Hughes Network Systems in the US, where it is already widely deployed. In October, the carrier began a 200-site trial with the National Farmers Federation, ahead of an official launch expected in the first two months of 1999.

Big Pond Satellite promises impressive data rates in rural areas. The basic Turbo Internet service provides a 64Kbps one-way downlink for dial-up Web browsing. An enhanced service is capable of 400Kbps throughput comparable to cable modem speeds. The low-bandwidth return channel operates via ordinary telephone connections. DirecPC technology can handle real-time multimedia applications such as video, and can also deliver multicast content at speeds approaching 4Mbps. In the US, the Turbo Webcast feature delivers unattended batch updates of popular Web sites.

DirecPC is Windows-centric: users will need a Pentium-grade PC with 16M of memory running Windows 95 or 98. NT is still under development, while Mac OS, Linux and other platforms remain unsupported. The PanAmSat-based service will have a receiving dish about 1m wide that normally requires professional installation from Ericsson, the local DirecPC service provider. At the time of writing, tariff and customer equipment plans were not yet determined.

While Big Pond Satellite covers home users, Telstra is investing in new options for outback business customers. The company is currently trialling Very Small Aperture Terminal (VSAT) technology from Israel-based Gilat that can deliver data rates up to 512Kbps to small customer dishes. Designed to meet intranet and wide-area network

needs for customers such as banks and retail chains, the SkyConnect VSAT service delivers 512Kbps outbound and supports multiple return channels up to 76.8Kbps.

Although it is coy about details, Optus is known to be examining satellite Internet options. Spokesperson Glen Thomas claimed the carrier could roll out 64Kbps data services within 12 months across existing satellites. Optus believes the Federal Government's Regional Telecommunications Infrastructure Fund (RTIF) should be used to subsidise customer premises equipment for satellite services.

"Optus and Telstra could compete in this market," said Thomas.



Telstra's mini-sat phone uses Inmarsat3 satellites for communication from remote areas.

"Technologically we could do it very quickly — whether there is the political will is a different issue. The RTIF should be used to promote competition."

Competition in this market is only just starting. Using the four geostationary AUS-SAT birds acquired with its carrier licence, Optus has become a strong contender in satellite telephony. Its portable MobileSat service covers the entire continent and territorial waters, with pricing somewhere between GSM rates and premium satellite services like Inmarsat. Some commentators suggest the \$800 million price tag made AUSSAT a white elephant for Optus, which has around 7,000 MobileSat customers. But Thomas said the satellites generate around \$100 million per year in television broadcasting business alone.

Telstra is also strengthening its satellite telephony operations. In specialist niches, the company now has a more flexible range of Inmarsat-based services. Digital Satcom-B provides voice and data delivery

up to 64Kbps, Satcom-C provides a bi-directional store-and-forward capability and MiniSat provides a small form factor, positioning Telstra to compete against Optus MobileSat. For fixed-location telephony in remote areas, Telstra is converting its aging Iterra infrastructure to digital, using Skylinx technology from Scientific Atlanta.

However, the most interesting competitor is a new entrant.

For people who need to stay in touch anywhere, anytime, Motorola's Iridium service could be just the ticket. Powered by a constellation of 66 Low Earth Orbit (LEO) satellites, Iridium promises worldwide connectivity. When you're within cellular coverage areas, the phone operates as a normal mobile on AMPS, GSM and CDMA networks. But as you move beyond the limits of local roaming partners (Optus and Telstra), the phone starts talking directly to the birds using satellite GSM.

Launched last month, pricing for Iridium is somewhat higher than conventional cellular phones, but it does offer one-number global roaming and many value-added services not available on traditional satellite networks. The company claims its LEO constellation delivers much higher voice quality and faster call connection than traditional high-orbit geostationary satellites.

Satellites could become even more important in future telecommunications. The Teledesic venture backed by Motorola, Bill Gates and cellular mogul Craig McCaw promises high-capacity Internet services worldwide. The first of its 288 LEOs was launched in February, and the \$US9 billion service is expected to begin in 2003. Teledesic has a revolutionary bandwidth proposition: residential subscribers will have a 64Mbps downlink and 2Mbps uplink, while commercial users will have access to 64Mbps both ways.

The information skyway won't be without competitors for long. Alcatel is promoting its own 'fibre in the sky' system called SkyBridge, and another LEO competitor called Globalstar has begun launching.

"We're beginning to see satellite come into its own, because it's a cost-efficient and equitable way to provide services," said Optus' Thomas. "Copper and fibre are not going to cover everyone."

Dan Tebbutt

even to 3G technology. However, recent economic setbacks mean that the planned uptake of wireless technology in some Asian nations has slowed, and no-one is certain when this will pick up again. In more developed countries, 3G services will be added to existing infrastructure — just as CDMA can use parts of existing AMPS technology.

If the third generation develops as hoped, an important complement will be the Bluetooth open standard, recently developed for wireless data connection between peripherals and mobile communications devices, using the collective resources of mobile phone companies (see page 77).

The big picture

Consumers of wireless mobile telecommunications have a right to be confused. The sheer level of jargon in the industry is overwhelming, and in many cases they are still expected to understand terms like GSM, CDMA, SIM cards and global roaming. But the popularity of mobile phones in Australia shows that sheer convenience is what counts. Despite compulsory shifts to new technologies, and the occasional hiccup in services, Australia is very well served by its mobile communications networks. There are much worse places to own a handset.

The future promises a great deal more than just voice calls, presuming customers actually want more. The wideband services currently being hyped will probably take significant time to appear, with perhaps an initial elite market, but they do have the potential to make communications neater, and perhaps one day will remove all those unsightly telegraph poles and wiring to which we're accustomed.

Until then, hang on to your handset and enjoy the ride — things are going to change fast, whether we like it or not. ■

Interoperability of technologies

Technology mix	Does access interoperability apply?	Handset availability
Terrestrial analog AMPS 800 and D-AMPS 800 or 1,900	Yes	Already in place in North America. Dual-mode handsets now available.
Terrestrial analog AMPS and terrestrial cellular digital CDMA	Yes	Already in place in North America. Dual-mode handsets now available.
Terrestrial cellular digital CDMA and terrestrial cellular digital GSM	No	Technically feasible. To date no commercial incentive to develop.
Terrestrial cellular digital D-AMPS and terrestrial cellular digital GSM	No	Technically feasible. To date no commercial incentive to develop.
Terrestrial cellular analog AMPS and terrestrial cellular digital GSM	No	Technically feasible. To date no commercial incentive to develop.
Iridium satellite and terrestrial cellular digital GSM	Yes	Being manufactured. Expected to be available 9/98.
Iridium satellite and terrestrial cellular digital CDMA (at 800MHz and 1,900MHz)	Yes	Being manufactured. Expected to be available 9/98.
Globalstar satellite and terrestrial cellular analog AMPS and terrestrial cellular digital CDMA	Yes	Tri-mode handsets currently being developed.
Globalstar satellite and GSM	Yes	Dual-mode sets being developed.

Source: Australian Communications Authority

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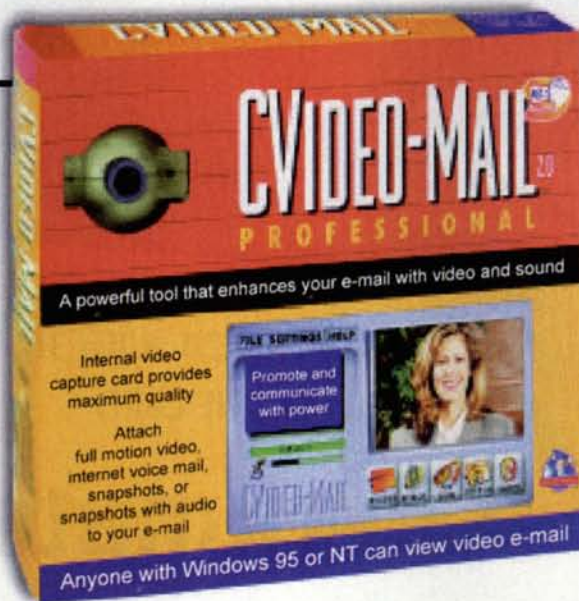
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A small outdoor recreation business promoted a weekend getaway with CVideo-Mail. Their response can be summed up in a single word: Outstanding. In fact, several customers said they signed up, "just because the e-mail was so cool."



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Annual Report 1998

Matrox Graphics Inc. sets record sales for 1997-1998 of \$490 million US

Matrox Graphics Inc. today posts record sales of \$490 million US for the 1997-1998 fiscal year - confirming the company's number one position in the highly competitive graphics industry. A major contributor to this success is the Matrox Millennium graphics chip technology that powers the industry standard Matrox Millennium and Mystique High performance graphics accelerators. Matrox Graphics Inc., designer and manufacturer of graphics and video chips, is a separate division of privately held Matrox Electronic Systems Inc. founded in 1976.

"The relentless efforts by the Matrox engineering team to push the envelope on graphics ASIC development has allowed the company to grow at a phenomenal rate

to become their number one manufacturer in the highly competitive graphics industry," explains Lorne Trotter, President and co-founder of Matrox. "The constant profitability of the company has also allowed Matrox to fund its own growth and invest in the development of new products that meet the highest standards in performance in the upcoming

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Advanced multimedia phones and new mobile technologies are bringing a fresh and friendly face to the Web. **By Dan Tebbutt**

The ultimate client

For all its raging success, the Internet has struggled to move from geekdom to the mainstream. Certainly the online population has grown, most companies have a Web presence and every alert executive now has an email address. But behind the scenes a modemless majority remains disenfranchised by the complexity of computers and the Net.

Figures published in June highlighted the problem. Over a million Australians have used the Net, according to the Australian Bureau of Statistics. That sounds impressive until you consider that 2.9 million homes have PCs. In other words, well under half of the subset of potential Internet users actually goes online, whereas 3 million people play games, 2.8 million study and nearly 2 million work on their PC.

These numbers suggest the Net has so far failed to traverse the gulf between the study and the living room. The technical, solitary and time-consuming nature of the PC Internet experience is alien to other parts of the house where people move between activities with abandon. Every few commercial breaks during the cricket, for instance, elder brother might leave the TV room to make a sandwich, grab a beer or ring his mate. Dad might move back and forth between cooking dinner and washing the tribe's clothes. It's all quick, no fuss and impulsive. But the way the Net works today, neither of them are likely to join little sister surfing the Web just to find out which movies are showing tonight.

This suggests there's a large unfulfilled need for a simpler device to provide instantaneous access to the real commodity of the Internet age: information. Numerous wily developers have attempted to fashion some form of easier information appliance. Microsoft's WebTV has been the most successful effort, while Apple's iMac represented a more PC-centric attack. However, over the next 12 months a new approach is set to emerge.



Instead of trying to tame the PC or mismatch the Net with set-top television devices, researchers are revisiting the humble telephone as an Internet client. Decked out with keyboards, colour screens, modems and email, these new Webphones won't look like your grannie's black Bakelite. Yet the world's largest consumer electronics companies believe adding Net functionality into the familiar phone form factor will free the Net from its PC prison and make online information part of everyday life.

Put simply, it's the quest for the ultimate client.

New clients

"The Internet is still just a lot of hype and it won't reach the masses," proclaims Terry Crews, an Australian developer who's tackling the Webphone market. A 30-year veteran of the local electronics industry, Crews set out four years ago to develop an easier device for accessing information and buying goods and services online. Pioneering experience in home banking services made him acutely aware of the requirements for success in what's now called electronic commerce.

"I don't believe the PC, the TV or the set-top box will dominate in the home market," he said. "Each has a role to play, but the phone is the most intuitive information access device in the home." Crews' ideas crystallised in the shape of Multelink (see picture above), a phone incorporating the most useful PC characteristics.

The most common failing behind conventional PC approaches is the assumption that mass market penetration depends on a fancy graphical user interface, Crews said. This misconception has led to enormous software bloat and steep learning curves. In contrast, Multelink's outer case was designed before the inner workings in order to maintain strict discipline. The company's engineers created their own multitasking real-time operating system that runs in 32K of memory using a cheap 16-bit industrial microprocessor from Siemens. Multelink has a backlit 320 by 240 monochrome LCD. Inbuilt software includes a personal organiser and a name and address book that can match contact phone numbers with network caller ID functions. Memory varies from 2M to 20M according to customer needs, and USB-based intelligent hubbing allows interconnection

with other devices. To ensure hardware won't date over the expected 10-year life span of the product, programmable logic arrays and digital signal processors (DSPs) are used with an emphasis on remote control.

Aimed at home and small business markets, Multelink is expected to be on sale by Christmas for around \$400. The company intends to start US and UK sales through joint ventures next year. By 2000, IDC predicts 22% of the 100 million Web-browsing devices will be non-PCs. Even if Web-phones grab just half the non-PC segment, that would mean more than 10 million units shipping inside two years. But the Australian startup won't have this growth market to itself for long.

Dominant customer premises equipment (CPE) supplier Alcatel is already testing a competitive solution in Europe. Inspired by the success of the Minitel online service in which it participated in its native France, Alcatel is trying to apply many characteristics of the proprietary service in the Internet context. The company hopes to accelerate ecommerce adoption among small business and consumers by providing a clear interface with quick sign-on and immediate results. Like Multelink, the Alcatel Internet ScreenPhone (see picture above) sports a smartcard reader, internal 33.6K modem and retractable keyboard, but the multinational's device incorporates a 640 by 480 colour VGA touch screen. The second generation will have optional ISDN or ADSL interfaces, but the base model does not have any I/O ports. That's because the ScreenPhone is not intended as a PC substitute, said Alcatel's access business development manager John Nacheff.

"The ScreenPhone is not designed to replace your PC for a one-hour surfing session," he explained. "It's about things that you want to do very quickly — finding a piece of information, purchasing something like an airline ticket or making a restaurant reservation. It sets out to make that particularly easy." Nacheff suggested the Internet ScreenPhone was exactly the kind of device that a typical family could use to find instant information about what's on at the cinema and perhaps purchase tickets.

"It is a recognition of the fact that a lot of the things we do on the Internet are very

much transaction-oriented," he said. A Webphone would complement a PC rather than replace it. "It's a progression from a telephone handset rather than being a cut-back computer. It's building on the sort of things people do with a telephone handset and enhancing that, rather than coming from a computer paradigm and cutting back."

Alcatel's HomeTop user interface provides one-touch access to ScreenPhone services (see picture below). A telephone company or Internet service provider can configure the interface with content partners, and individual users can personalise its look and feel. Using smartcard authentication, the same server-based preferences can be accessed from any Webphone. "This is like a network computer: the intelligence is in the server," said Nacheff.

Although Internet standards make



ScreenPhone server-independent, Nacheff emphasised that CPE is only part of the solution. The most useful functions reside in Alcatel's Value Added Services Pack (VAS-Pack) server platform. A series of network modules provide access to services like push channels, try-before-you-buy software downloads, direct marketing and Plug-and-Surf, a DHCP-based routine to connect and register with an ISP.

Alcatel's integrated browser supports HTTP 1.1, HTML 3.2 and SSL 3.0, while an internal cache improves response times. Bookmarks are stored in a server-based directory that is accessible through Lightweight Directory Access Protocol (LDAP)

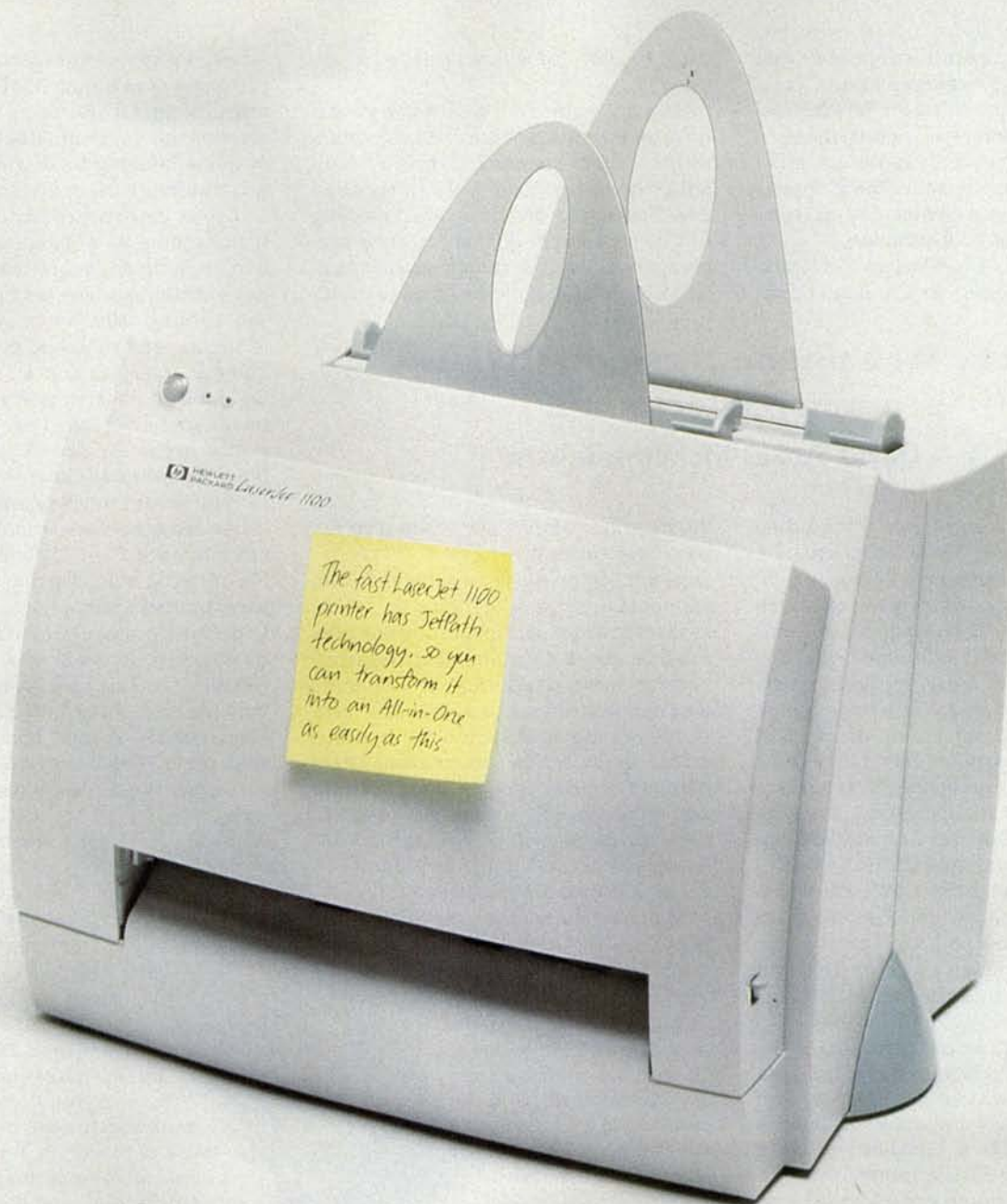
and Java Naming and Directory Interface (JNDI). The server uses a software bus architecture based on Internet Inter-ORB Protocol (IIOP). Nacheff said this design allows VAS-Pack to run on multiple platforms and interface with legacy environments like telco billing systems. "The IIOP software bus essentially creates independence between the physical and logical distributions of the various VAS-Pack elements and the surrounding environment. It becomes an easy plug-in for a telco or an ISP in terms of interfacing into their existing network."

In addition to its Web capabilities, Nacheff suggested the ScreenPhone interface would make cumbersome telco services like call waiting, caller ID, forwarding and conference calls easier to use. Not only will this be convenient for consumers, telcos will celebrate higher call-completion rates, he said. Directory integration allows intelligent filtering based on the user's name and address book. The device has a unified messaging interface: a single light flashes to announce both voicemail and email, and messages are accessed through a simple press of a button.

Alcatel is currently trialling Internet ScreenPhone with France Telecom, and Nacheff predicted local experiments in mid-1999. He said the service would not depend on unbundling local-loop access because it operated as a point-to-point solution in which any service provider can deliver a branded customer interface. "Any massive service provider that bills the bulk of customers might want to build those relationships and want to be the front person that customers talk to, rather than simply being a service provider on that interface," he said.

Another new device is the Samsung Web Video Phone (WVP), expected to go on sale in the second quarter of next year. Initially developed for the US market, the WVP is now being adapted for the Australian market with changes such as a printer port and possibly a 56K modem. It has many features in common with the Multelink and Alcatel products, but Samsung has gone one better and included videoconferencing capabilities. A screen-mounted camera supports H.323 Internet video calls, voice over IP (VoIP) and H.324 video over the telephone network.

Samsung's Mark Tyler believes that a significant mass market opening exists for



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basic Internet, online commerce and videophone services that eschew PC complexity. "There are still a lot of older people who are nervous about using a computer," he said. "People are more accustomed to a telephone. The telephone can claim to have a greater play on e-commerce because of its distribution."

Most major CPE vendors are now working on Webphones. In Canada, Nortel

could be provided without carrier cooperation.

"It's not really a big deal because telcos have to advertise their tariffs and communicate them to the market," he said. Multelink has considered VoIP integration and Crews said an attractive possibility will be on-the-spot discounts. Like a telephony consumer's red light special, Multelink could offer half-price calls to the US

"The Web phone is essentially an e-commerce terminal."

— David Stokes-McKeon, Telstra

Networks is testing a new Java-based device codenamed Network Information Appliance. The company's European joint venture is working with a major telco testing a Windows CE-based product called the Matra Nortel Tel@phone. Philips is also working in the Webphone space, while in October Sharp introduced a Multimedia Phone in Japan and the US. This Webphone features pen-based input with handwriting recognition on its touch-sensitive colour LCD. Its autopilot feature connects to the Internet at specified intervals to check for messages, and the Multimedia Phone can prefetch Web content to store within the expandable 4M flash memory. An IrDA port supports communication with digital cameras and synchronisation with Sharp Zaurus electronic organisers.

Although the market remains fledgling, these devices have enough commonality to sketch an outline of the typical Webphone. Likely hallmarks include: a touch-screen LCD; a keyboard; an HTTP 1.1 and HTML 3.2 compliant browser; email and voicemail; a card reader and SSL security; an icon-based GUI; and interfaces to the PSTN and possibly ISDN or ADSL. The next question is which applications these hybrid machines will run.

New services

Surprisingly, Terry Crews believes Multelink's killer application will be telephony. The company will offer a service known as least-cost routing, where the latest pricing information is downloaded every day so the handset can send calls via whichever carrier happens to be cheapest to a particular destination when the call is initiated. Comparing telco rates may sound complicated, but Crews claimed tariffs are relatively stable and the service

for the next two hours, say, where a carrier has excess capacity.

Home shopping is another potential winner. Catalogue data such as prices, product descriptions, images and barcodes could be stored in the phone. An attached barcode wand could scan in household items as they run out, automatically generating a shopping list than can be transmitted to an online supermarket. Other planned services include home betting and share sales. Crews said new applications can be created in days using Multelink's drag-and-drop development environment under Windows NT.

When he started work on the project, Crews believed smartcards would be the main technology driver, but their slow adoption and fragmented standards have been barriers. Multelink has an internal smartcard for user authentication plus an external card reader. The company avoided alignment with a single smartcard model, and Crews decried demands by vendors like Visa and Mondex for per-unit royalties in addition to huge up-front payments. "They believe their payment schemes will drive the market, but in fact devices will drive the market," he said.

Both Multelink and Alcatel's Plug-and-Pay e-commerce module used smartcards in preference to magnetic stripe readers, although Samsung's product opts for the here-and-now technology. Nacheff and Crews said Visa was already issuing chip-powered cards in Europe, and Australia would follow suit. In Canada Nortel is conducting home banking trials with Verifone and Mondex systems that allow customers to download

money to stored-value cards, effectively providing a personal ATM service. Multelink's Smart Banking application reverses the traditional dial-in paradigm of home banking by downloading static account information overnight.

Crews emphasised that the transactional nature of Webphones means they don't require enormous bandwidth. Buying something online only involves sending around 100 bytes, so a normal telephone line would be more than adequate as a back-channel. ISDN would be an excellent download technology, while digital subscriber line (DSL) would handle future needs for two-way communications, according to Crews.

Both Telstra (in 1995) and Optus have conducted trials using Analog Display Services Interface (ADSI) telephones from Nortel. ADSI is an evolving standard that led to the first screen-phones around 1992. It defines protocols to send text messages down a phone line to intelligent CPE devices. Last year Optus ran home-banking and phone-based Internet trials across its HFC (hybrid fibre/coaxial) network using ADSI devices, but the company remains guarded about future plans for advanced network services.

Web phones are simply another example of the CPE diversity that sprawls further every day. Telstra's managing director for Internet and data services, David Stokes-McKeon, has the job of ensuring the carrier can handle whatever network attachments come along. For most of the 1990s Telstra has been focused on rationalising its enormous infrastructure around digital technologies in the Future Mode of Operation (FMO) project. Now Stokes-McKeon said attention is shifting towards preparing the network for an era when data applications overshadow traditional circuit-switched voice. The nascent Data Mode of Operation (DMO) initiative aims to ensure new investments align with data demands for both fixed and mobile clients.

The unwired planet

New information access technologies are also awakening the sleeping giant of wireless data applications. Today more than 90% of traffic on mobile networks is voice-related, according to Chia Eng Keat from Motorola's Singapore-based cellular sub-



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scriber division. But starting with the Short Message Services (SMS) already offered by GSM (Global System for Mobiles) carriers, mobile data applications are poised for explosive growth. Rudimentary SIM Application Toolkit software enabled basic interactivity, but Chia predicted new handset capabilities and network technologies will foster much bolder applications.

Current mobile data services are focused on delivering tightly filtered information to the handset. Optus Update is a classic example: based on SMS, this service brings to subscriber handsets short bursts of data about topics like the stock market, weather, traffic, airline times or sport. The user can manage their preferences through the Web (<http://www.update.optus.net.au/>), and specific data can be downloaded on demand.

In the near future, mobile phones are likely to expand into a general-purpose client platform for accessing information and applications on the Web, according to Janne Jormalainen, general manager of wireless data and technology for Nokia Asia-Pacific. He predicted all future phones will have broad Web capabilities, but the main focus will be commerce-oriented tasks like telebanking and information access. "We don't need to go hunting the killer app for mobile services because it is already there on the Web," he said.

By 2005, there will be around 1 billion cellular phones worldwide. As Jormalainen pointed out, that's 1 billion more Web browsers. "We believe the mobile phone is going to surpass the traditional phone for all voice traffic. Then it will continue to data, and then further to wide-band data," Jormalainen said. "Every mobile phone will become an Internet terminal."

"Mobile networks will be used as access networks," he added. "When people get used to Web access in the office and at home, they want and require the same access when they are mobile. That's what we've seen with voice when we introduced mobile phones." Escalating expectations will lead to new applications like cellular access to LAN services and mobile video, he said.

Although they aren't yet what we'd hope to call Webmobiles, new cellular phones featuring improved Internet and personal digital assistant (PDA) capabilities have already started to appear. The Nokia Communicator 9000 was the first example of a phone with organiser, email and Web features built in (see APC October 1996, page 44). The Communicator

flipped open to reveal a keyboard and 640 by 200 monochrome screen. It included PC synchronisation via infra-red and the ability to set up calendar appointments via SMS messages. In the second-generation Communicator 9110, Nokia addressed the frequently criticised bulk of the first model.

In June Alcatel unveiled the One Touch COM, a combined PDA/phone with a large screen, email, and synchronisation support with Microsoft Outlook. Costing around \$1,300, the company believes these integrated devices are most appealing to vertical enterprise markets or travelling executives. Sharp launched its Personal Mobile Communicator (pictured on previous page) in August. A stylus-driven icon interface supports email, calendaring and other PDA functions using the same technology deployed in Sharp's SE-300 organiser. The phone is much smaller than the Nokia, but it still finds room for a healthy LCD and an infra-red port. Motorola is close to shipping its own smart-

phone with organiser capabilities, after first demonstrating the technology way back in 1995 at CeBIT. Chia explained that the company wanted to ensure the phone would be portable and practical. "It's based around a standard phone. We are adding data functions to a voice device, not the other way around," he said.

Driving forces

As a client platform for accessing network information and services, the cellular phone's greatest advantage is mobility. The fact that a mobile is designed to operate permanently as a wireless network device defuses many of the design difficulties faced by general-purpose clients like laptop computers and PDAs. The flip side is that their specialised nature limits the potential for current cellular handsets to operate as flexible networking devices. Mobile phones are hamstrung by characteristics such as small screens, limited memory,

Wireless data approaches maturity

SMS-based newsflashes like Optus Update represent the first stab at cellular data applications, but the standard likely to carry the genre forward is Wireless Applications Protocol (WAP). Defined by the WAP Forum under ETSI, the GSM standards body, the new protocol is "an evolution of messaging", according to Optus's Colleen Wade. The WAP Forum was founded by Ericsson, Nokia, Motorola and Unwired Planet in June 1997 with the objective of creating a global protocol for two-way wireless applications sensitive to individual handset capabilities (see <http://www.wapforum.org/>).

A WAP server formats email and Web content for a microbrowser that runs inside a phone. Content must be reauthored in Wireless Markup Language (WML), although some products use the pre-standard Handheld Device Markup Language (HDML). WML content is transmitted through a telco's WAP server from a standard HTTP daemon at the content provider. The dominant player in both browser and server software is US-based Unwired Planet. "Unwired Planet is fast becoming the next Netscape," said Paul Schofield, senior product manager for wireless data at Telstra.

WAP crunches pages down to about 1% of the normal bandwidth requirement. Schofield said 300 bytes would be

considered a big WAP page. The protocol is network agnostic, so it can run over any transport including AMPS, GSM, CDMA, SMS, wireless datagrams and even normal circuits.

The catch is that handsets need to support WAP. Wade admitted expecting customers to buy a new handset is a big ask, but products are coming early in 1999. Chia Eng Keat said WAP would allow phones to use the Net more effectively through technology that's attuned to client and network protocol limitations. "All the intelligence of the seven layers that we are familiar with in OSI will actually become part of the phone capability," he said. "WAP allows the phone to browse through the Internet more conveniently and more rapidly."

Telstra recently started one of the world's first experiments using Alcatel's WAP-enabled One Touch Pocket phone. The objective is to make WAP a mainstream product, said Schofield, a WAP Forum director. "It is our aspiration that every single mobile phone will have a WAP browser in it," he said. "It is possible that there will be more wireless devices accessing the Internet than wired devices — but it's not going to be a mass market from the start," he added.

"WAP is step one on the road to mobile multimedia."



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puny processing power, proprietary I/O architectures and immature data application capabilities. Fortunately, a number of emerging technologies could foster radical improvement.

The weakest aspect of the GSM digital architecture is the 9,600bps data rate. "You can't make the applications very sophisticated at that speed," admitted Jormalainen. The new WAP standard (see 'Wireless data approaches maturity') will lift throughput to 56K within a year, he said, before third-generation mobile technologies push bandwidth towards 2Mbps. That rate is certainly fast enough to surf the Web, while LAN applications and even video start looking feasible.

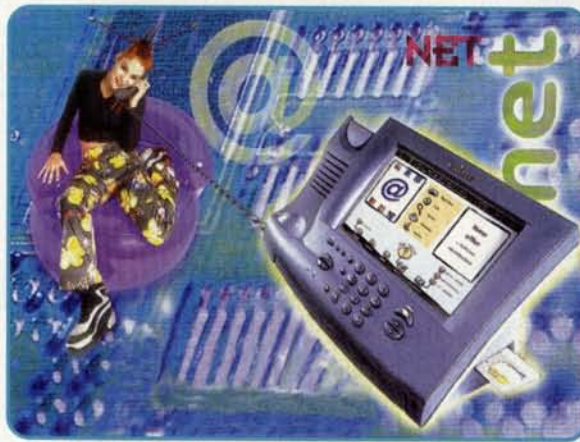
"There is nothing that would limit us in future from introducing sophisticated Web-based applications in the mobile market," said Jormalainen. "Perhaps the mobile phone won't look like it does today, but the most compelling issue with a mobile phone is that you have it with you all the time and anywhere. I don't see that being any different when we move to data-based applications. The evolution of mobile phones towards the IP area is a natural move."

Sharp spokesperson Mark Leatham believes new display technologies will soon make larger colour screens attainable. "Advances in LCD will really make this mobile area jump ahead," he said. "We can now make virtually paper-thin liquid crystal displays, which mean wrist-watch information managers or telephones are not very far away. In terms of email or Web access, that's pretty cool." Without better screens, efforts like WAP would flop, he added.

Moore's Law suggests processor and memory issues are approachable, while another technology worth watching is Bluetooth, a short-range interconnection technique for linking mobile phones to PCs, printers, cameras and other devices (see 'Phone talk', page 76).

Exact Webmobile designs will depend upon vendor priorities, but Optus recently devised internal guidelines about its expectations for smartphones. Services that Internet-ready mobiles should handle include: voice with caller ID; hands-free operation and multiple line support; personal organiser and diary functions; a pen-based graphical user interface to both PDA services and phone functionality; a larger screen; data, email and SMS; an internal modem; plus PC integration and synchronisation via IrDA or RS-232 interfaces.

Voice-driven interfaces are also likely to become a new force in the mobile CPE market. An early example is the Philips Genie that uses voice recognition to access the address book and initiate calls by name. The next challenge is opening Internet data applications to voice interfaces. In October Motorola demonstrated a technology called Voice Markup Language (VoxML) that reads Web pages to a telephone client and



responds to voice commands. VoxML software operates via a normal HTTP server but requires a voice browser on the handset. It's based around Extensible Markup Language (XML) and Motorola plans to submit VoxML to Web standards bodies (see <http://voxml.mot.com/>). A number of companies are working to develop similar functionality for email. For example, General Magic's Portico service combines inbound voicemail, email and fax correspondence through a voice or Web interface (see <http://www.generalmagic.com/portico/portico.html>).

Converging platforms

Perhaps the most interesting new hybrid phone is the pdQ from Qualcomm, a dominant supplier of CDMA-based cellular technology in the US. pdQ is a phone with a 3Com Palm III organiser embedded in it. Although it won't be available locally until Telstra establishes its CDMA network (see 'Phone talk', page 76), the Qualcomm phone represents a daring attempt to harness the world's top-selling PDA product. pdQ runs hundreds of PalmOS applications, it exchanges data with other phones and Palm III organisers via HotSync, and the 160 by 240 LCD touch screen supports Graffiti hand-writing recognition software.

Deploying familiar PDA platforms

inside phones seems an obvious move, but 3Com sources were unable to confirm whether similar GSM implementations were under way. Colleen Wade, manager of mobile and integrated product development at Optus, indicated Palm-based GSM phones would be available later in 1999. The Qualcomm phone is an experiment to find a better integrated solution than the chunky Nokia Communicator, according

to Ken Kozak, business development manager in 3Com's Palm Computing division. Ironically, Kozak is sceptical about the notion. "There's a lot of talk about the two becoming one. I personally don't know if I agree with that: there are a lot of places I will take my Palm where I won't take my phone, or vice-versa. If the two are combined and one fails, then you are out of luck with both."

Another obvious platform for both mobile phones and Webphones is Windows CE. Nortel's plans are well

advanced with the Tel@phone landline device, and Sharp has considered Microsoft's embedded OS for Personal Mobile Communicator, currently powered by proprietary organiser technology. "[Windows CE] seems well developed as a mobile information manager," said Leatham. "It's easy to use, it has a familiar interface and it's not particularly power-hungry in terms of battery life, plus it can run on RISC chips that make it quick and easy to deploy."

Microsoft's dominance made CE a more likely alternative than the 3Com platform, added Leatham. "We acknowledge the power of Microsoft. Our view is that they will have the power to make Windows CE a standard," he said. Samsung has also experimented with CE-based mobile phones in Korea. Optus' Wade feels the Microsoft OS could make major inroads into the mobile applications market once smartphones become the norm. "People want mobility on a smaller device, but they are used to larger monitors and Windows applications," she said. "There is nothing better than sending a fax after spell-checking it."

Java is another potential player in the Webphone and Webmobile space. Alcatel depends on Java in its Internet Screen-Phone, and Nortel, Samsung and Philips licensed Java for Internet phones as far

back as 1996. Sun claims most telephony vendors have Java-enabled phones under development, but the company recently became more proactive in helping licensees port Java to their platforms after finding the previously decentralised approach took too long.

Sun's John Arnold said Personal Java would be the obvious choice for screen-phones where it can run in 512K of memory on low-end 32-bit processors using real-time operating systems like Chorus and GeoWorks. Mobile phones are more likely to adopt Embedded Java which requires anywhere from 8K to 512K depending on the number of APIs used. Using JavaCard, developers can even download applets to SIM cards with at least 8K memory. Most SIM card vendors

tions. "The consumer is going to become more immersed in the Internet," said Samsung's Tyler, "as long as we can pacify the front end."

Towards the ultimate client

Convergence is an overused word in the 1990s, but it's apparent that telephony and Internet access technologies are merging just like backbone technologies for voice and data. Still, some observers doubt customers will endure the compromises of an integrated device when specialised tools are available.

"Those [integrated] products do specialised functions in an average way, and the user actually wants more practical tools for each of those things," said

"If we can pacify the front end, consumers will become more immersed in the Internet."

— Mark Tyler, Samsung

have already increased on-board memory from 4K to 8K, and Motorola's Chia said new cards typically have 16K. He predicted 32K cards would arrive in the near future.

Despite the appeal of these big name platforms, Crews said Multelink steered away from Pilot and CE-style technologies precisely because they assume too much PC literacy. Java amounts to little more than hype, he said, and it's unlikely to find widespread Webphone deployment because it adds complexity and taxes performance. "In a smart-card environment where processing and memory resources are very limited, software goes back to using bits not megabytes. You need efficient code and you can't have an interpreter," he said.

Moreover, Jormalainen warned that the most important thing for users is functionality and ease of use, not the underlying technology. "The operating system is not the most important part of the product," he said. And Sharp's Leatham predicted platform convergence would appeal more to technical users in the short term. "For tech-heads and businesspeople it's great, but for the general consumer we still have a way to go before convincing them."

Once the technologies do reach a consumer-friendly plateau, these new clients will spark a massive explosion in Internet communications and other data applica-

Paula Callenbach, marketing manager for Ericsson's mobile phone division. The Swedish telecommunications giant recently introduced several products for connecting GSM phones to standalone devices. The Ericsson DI-27, a \$395 clip-on infra-red modem, provides 38Kbps connections from the phone to Windows PCs, CE handhelds and Palm III or Psion organisers. There's also the GC-25 card that brings full GSM phone functionality directly to the laptop, like the Nokia Cellular Card Phone (see APC July, page 42). And last month Ericsson released SH-888, a GSM phone with infra-red and modem functionality built in.

Ultimately the fact that devices can communicate is more important than how they do it, 3Com's Kozak argued. Physical integration, infra-red/modem bridging or radio frequency Bluetooth connections could each play a part. The important thing is that computers and communications devices are now talking.

As devices become more interoperable, Chia expects consumer choice to proliferate. Some people will stick to the smallest possible phones, others will look for idiot-proof simplicity or a fashion accessory, and a minority will buy smart-phones with PDA and Internet capabilities. "The way I look at it, despite all this convergence, there will not be in the end just one device," Chia said.

Similarly, evolving wireline and wireless infrastructure will redouble the options rather than imposing a monolithic solution. House-bound Webphones will boast more computing power and display fidelity, but they will lack the freedom of Webmobiles. "Landline is always going to be a major part of it," argued Tyler. "The delivery of information down copper wire is going to get greater as compression becomes stronger. You will have a wired area as well as a wireless area and in future both of them are going to do basically the same thing, whereas at present wireless is way behind."

A range of applications will be available across each platform. Yet Telstra's Stokes-McKeon suggested broadband applications are likely to focus on landline networks because the CPE in this context will be a sophisticated multimedia PC. "The Webphone is essentially an e-commerce terminal," he said. "It's not for general purpose applications and playing around like a PC."

Telephone-based Internet terminals will need to cope with the metamorphic qualities of PC technology, which tends to subsume challengers by embracing new technologies. Declining PC prices will be a serious thorn in the side of Internet phones. Nortel business development manager Nick Avakion admitted it would be hard to position these new devices against ever cheaper PCs that feature bigger screens, more memory and many more applications. On the other hand, Webphones would be easier to use and because they are always on, they are more suitable for push and other active applications.

Yet advocates emphasised that these new clients complement PCs rather than replace them. Webphones will open up services that are theoretically available on the Web but so inconvenient that people are unlikely to access them. Few people are likely to spend five minutes firing up a PC to check which movies are on, but a Webphone could provide instant session details, directions to the cinema, ticket sales, even a short video trailer.

The new client concept begins to approach what Cisco chief scientist Bruce Nelson calls the 'IP dialtone'. "When you have constant IP dialtone, it makes a qualitative change in the way people live," Nelson told APC. "It's a question of pull down a bookmark and you're there. It's not just a business change — it's a social change." ■

Let's go SHOPPING

In this year's bumper PC feature we review 10 systems that won't blow your budget, and 13 that will blow your mind.

It's almost Christmas, and what could be jollier than sitting down in front of a PC that's still sparkling and fresh from the box? But before you venture into the big wide world of PC shopping, you need to read our reviews, because we've done all the hard work for you. Even if you don't find a system here that you want, you'll certainly have a better idea of what's available for your shopping dollar.

We've chosen to focus on two PC categories: budget systems and ultimate consumer systems. For the budget category we stipulated a price ceiling of \$2,000 to keep the competition tight and focused, but we threw the specification doors wide open for the ultimate category, placing no limits on what vendors put in their machines.

The submissions for the budget category show that systems far more powerful than last year's power machines are going for less than \$2,000. So when is the best time to buy a PC? In an industry where it only takes a few months for the newest, latest and fastest machine to become outdated, there is no ideal time to buy. But Christmas is as good a time as any, when vendors drop their prices and offer some good deals.

This has been a great year in terms of PC hardware advancement, so it's worth looking at what's been on the shelves in 1998 compared to what was around last year. Naturally, there was the inevitable march of faster and faster processors. Intel has the 333 to 450MHz Pentium IIs, plus the Xeon, Celeron and Celeron 300A. AMD has produced the K6 and K6-2 processors and Cyrix has come out with the 6x86MX series. The biggest and most important innovation was the introduction of the 100MHz bus, which has forever banished the 66MHz data bottleneck for those lucky enough to own a 350MHz+ Pentium II processor and a BX motherboard. Simultaneously there was the release of PC100 SDRAM, which comes into its own on BX motherboards. Similarly, 1998 saw Samsung develop the 128M SDRAM chip which has doubled the maximum RAM capacity of motherboards.

But 1998 wasn't just a year for new developments. It was also a year in which older technologies started to gain wider industry acceptance. One of these was AGP graphics cards, which have become an industry standard. With 2x AGP ports ubiquitous in today's PCs, we are seeing startling performance developments with the cards, especially in the field of 3D processing (see *APC* October, page 127)

Slow take-up

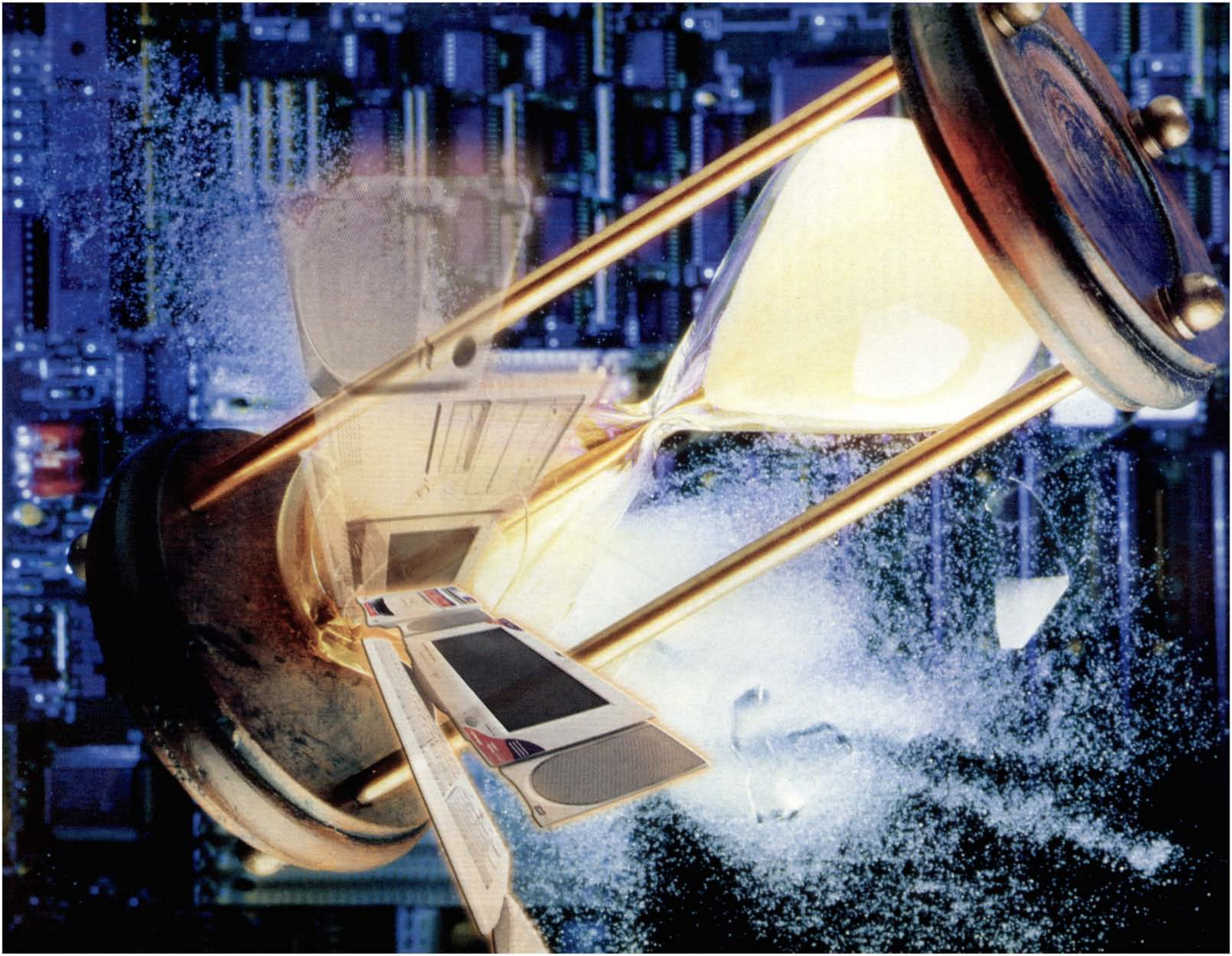
Two lagging technologies are DVD and USB. Right now you'd be hard-pressed to find a new motherboard that didn't have two USB ports, but you'd have to search high and low for a USB peripheral to plug into it. Fortunately, the industry is beginning to warm to this technology. DVD-ROMs, on the other hand, are suffering the same fate in the IT industry as they are in the audiovisual industry — it's a great technology, but no-one seems to want to make a major commitment to it. Six systems in these reviews feature DVD-ROMs, and apart from one excellent exception, their performance as CD-ROMs is par for the course — not very good. However, 3x

DVD will be out by the time you read this, and it'll be interesting to see the performance difference it will make.

By this time next year processor speeds of up to 600MHz are expected, and the 1GHz barrier should be cracked sometime in 2000. To back up these faster processors, 200MHz motherboard buses are also set to make an appearance sometime in 2000. By Christmas 1999, high-end systems should be equipped with Intel's planned 450MHz Katmai and 600MHz Coppermine processors. Both will use Katmai New Instructions, an enhanced multimedia instruction set.

Intel's only planned processor for lower-end systems is a 366MHz version of the Celeron. AMD's recently-announced K7 chip will be running at speeds of 500MHz or higher, and some experts believe it will be very competitive with the Katmai. Cyrix is planning a 600MHz processor code-named Jalapeno, which is said to include its own 3D graphics engine and will be able to run both MMX and 3DNow instructions. Cyrix's even more advanced M3 processor is expected to make an appearance late next year, but will probably not be in systems until at least early 2000.

APC staff

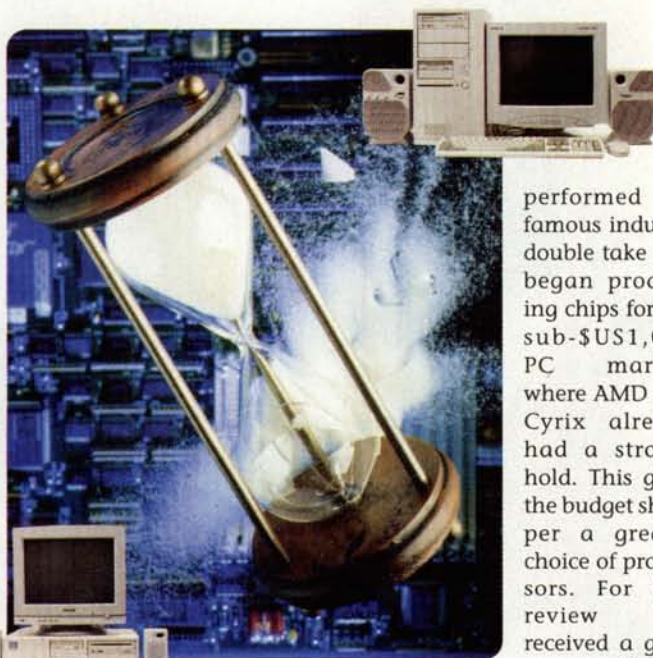


Budget SYSTEMS

This time last year we asked vendors to supply us with 'machines with grunt' for a consumer PC review, and the specifications of those machines now look a bit wan compared to the submissions for this year's budget (under-\$2,000) category. In 1997 a machine with a Pentium 233MHz MMX, 32M of SDRAM and a 3.2G hard drive was considered powerful. Things have certainly changed in 12 months.

This year we asked vendors to submit a system that complied with the following requirements: a minimum of 32M of RAM, a CD-ROM drive, Microsoft Windows 98 and, of course, a monitor, mouse and keyboard. They could put whatever else they wanted into it, but the most important requirement was that the system did not cost more than \$2,000. This proved to be a challenge for some of the vendors, and it was interesting to see what was included and what was sacrificed in the scramble to provide the best performance for peso. Some decided to submit machines that seemed suitable for the corporate market, while others focused on maximising their machines with multimedia capabilities for the budget-conscious home user.

The main pricing factor in a personal computer is the CPU. Earlier this year Intel



performed a famous industry double take and began producing chips for the sub-\$US1,000 PC market, where AMD and Cyrix already had a stronghold. This gives the budget shopper a greater choice of processors. For this review we received a good cross-section of

chips: two AMD K6-2 3D 300MHz CPUs, three 333MHz Celerons, a Cyrix 6x86 PR300, two 333MHz and two 350MHz Pentium IIs.

Aside from processor types and speeds, the other main sacrifice in the name of reducing system costs was hard drive size. It's surprising, then, that six of our 10 contenders included 5.1G Quantum Fireball drives. This was an excellent size for a budget machine, and was in fact the same capacity or greater than four of the ultimate machines.

Other pleasant inclusions were Edge Technology's Zip 100 drive, and the five machines that had 64M of RAM. Most bewildering, however was Datawell, which took us by surprise by not only fitting its system with a Voodoo2-based 3D accelerator card, but also pricing the machine more cheaply than any other in our review.

Darren Ellis

Advantage Celestial MP333 ADELONG COMPUTERS

In any PC review, there are always two or three systems that stand out from the others because they're particularly good, particularly bad, or just plain interesting. The Advantage Celestial MP333 was not one of those PCs.

It started with the case, which was plain and functional. Its Intel 333MHz Celeron processor produced average scores in the Ziff-Davis CPUmark32 test. It had 32M of RAM, as did the majority of systems in this category. It was supplied with a 5.1G Quantum Fireball EL hard disk drive, which was a popular choice for PCs in this category. According to the Ziff-Davis Business and High-End Disk WinMark 98 test results, this hard drive's performance was bang on average for the systems we tested.

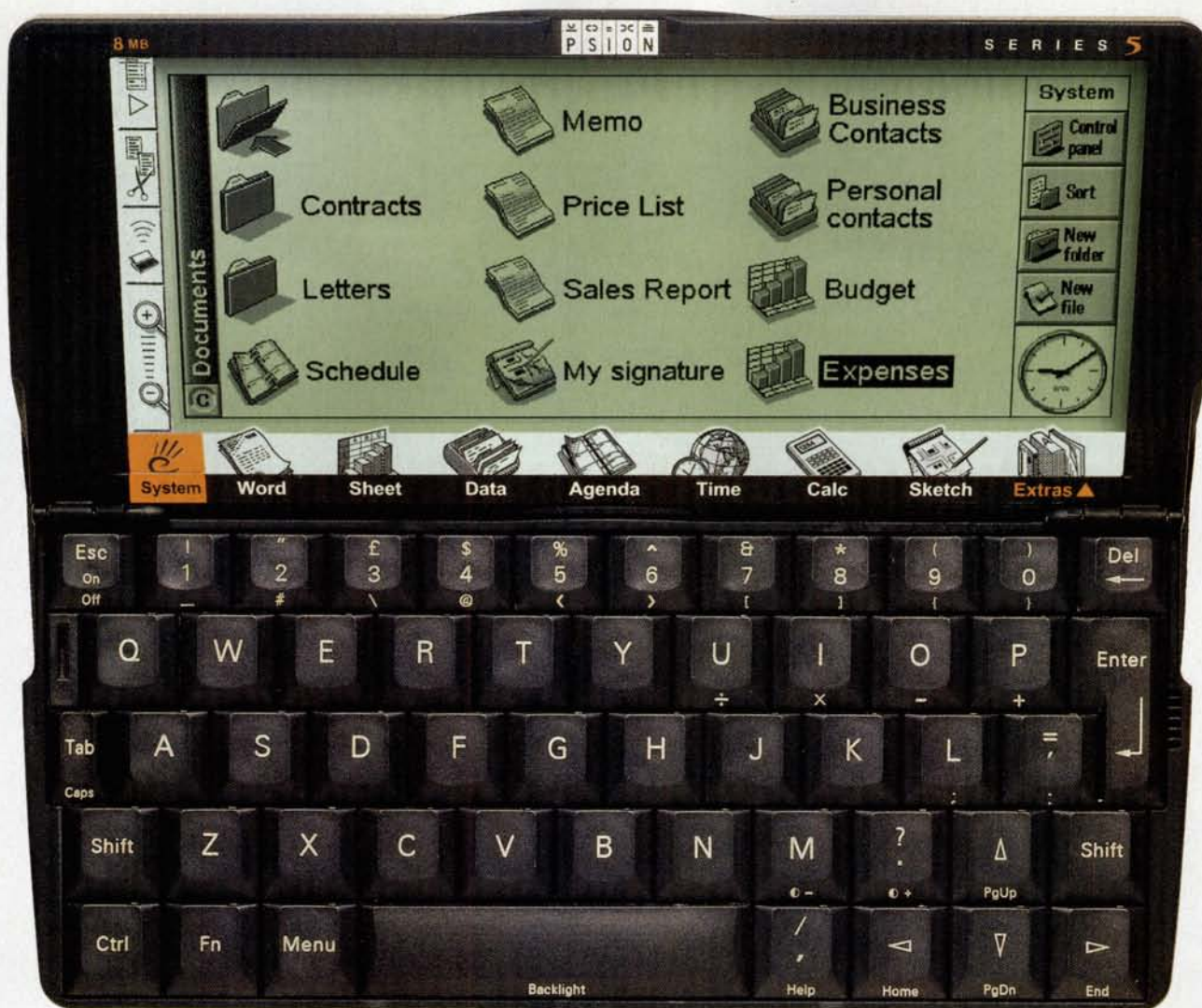
Graphics were thanks to a Diamond Stealth II G640 chip, powered by an Intel



i740 graphics processor. It achieved average scores in the Ziff-Davis Business and High-End Graphics WinMark 98 tests, and its 3D WinBench score was right in the middle of the field. The system's 15in DiamondView monitor looked good.

The ESS soundcard is at the less expensive end of soundcard prices, but was helped along by a nice pair of Altec Lansing speakers, so the overall sound was pretty good. The Advantage Celestial came with a Matshita 32x CD-ROM, rebadged for some reason as Creative Labs. Its score in the Ziff-Davis CD-ROM WinMark 98 test was, once again, close to the average.

Compared with some PCs in this category, Adelong did not try all that hard. For example, Landmark's Diamond 2000 had the same processor and hard disk drive, a similar graphics card, CD-ROM and monitor, but Landmark threw in another 32M of RAM, Lotus SmartSuite 97, and an internal modem for the same price.



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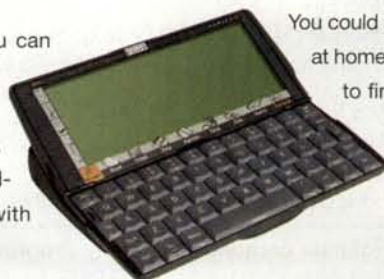
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There's certainly nothing wrong with this PC, and it would adequately serve most users' purposes. But there's nothing to get excited about either.

Josh Mehlman

- **Distributor** Adelong Computers
- **Phone** 1800 626 345
- **Online** <http://www.adelong.com.au/>
- **Price** \$1,995
- **In short** Average.

Alpha PII-350

ALPHA COMPUTER

Melbourne-based Alpha Computer has participated in our annual PC feature for a number of years now, and usually manages to come up with some impressive systems for excellent prices. This year was no exception.

Somehow Alpha managed to squeeze a 350MHz Pentium II and a BX motherboard into a system priced at under \$2,000. And it had the performance figures to show for it. It was the fastest computer priced under \$2,000 we looked at, challenged only by the Pioneer machine, which was the only other system with a 350MHz processor. The subsystems also held up very well; the Alpha performed consistently well in the Ziff-Davis WinMark tests. This machine could have almost competed in our ultimate systems category.



It scored 26.83 in Ziff-Davis Winstone 98, just ahead of second-placed Pioneer. In 3D WinBench, it came second, behind the Pioneer. It tussled with the Beyond system for best disk performance, and likewise with the Pioneer for best graphics CD-ROM performance.

It came with a large IDE hard disk drive (5.1G) and an AGP i740-based graphics card (the Diamond Stealth G460 with 8M of video RAM). A 36x CD-ROM drive and a Sound Blaster 16 soundcard provided

multimedia capabilities. Its performance results reflected its 64M of memory, and the system had plenty of room for extra memory — up to 1,024M, in fact.

Like all but one of the systems under \$2,000, this machine came with a nice 15in monitor — but it might be worth shelling out a few hundred dollars extra for 17in to complete an excellent system. It comes with a two-year parts and five-year labour warranty.

The system was supplied in a neat desktop case, with tinny little speakers (hey — what did you expect for the price?). The case did not allow for a lot of expansion in terms of external drive bays, although there were plenty of spare PCI and ISA slots inside.

Quite frankly, this machine kicks butt for the money it costs. Definitely a recommended buy.

Nathan Taylor

- **Distributor** Alpha Computer
- **Phone** (03) 9415 9177
- **Online** <http://www.alphacomputer.com.au/>
- **Price** \$1,999
- **In short** Slap on a 17in monitor and you've got yourself a power user's system.

Vogue Challenger 300MHz

ALSO TECHNOLOGY

Also Technology tried an interesting move with its Vogue Challenger model. Opting for a less expensive processor, the AMD K6-2 3D, allowed the vendor to add some pretty impressive components and still remain under the \$2,000 price cap for this review. However, the move may also have stymied this PC's performance to an extent.



On the good side, it had 64M of RAM, which was very good for a budget system, and a 5.1G hard disk drive. It had a Matrox Millennium G200 display adapter, which was the most expensive card installed in any of the budget systems we reviewed. To a spoiled technical reviewer, the 14in monitor was a bit too



EDITOR'S CHOICE

● Alpha PII-350

HIGHLY COMMENDED

● Pioneer 98 SOHO PII-350

On performance alone, it was hard to pick between these two PCs, both of which produced outstanding figures in our tests. They tussled for first place in almost every test. We were impressed that both PCs came with 350MHz Pentium II processors and still managed to contain a full complement of features. Both had decent display cards, hard disk drives and CD-ROM drives for the price. The only real differentiator, and the one that put the Alpha ahead of the Pioneer, was the inclusion of 64M of memory.

Special mention should be made of Datawell's Expert Entertainer model, which packed in a Voodoo 2 card, making it a good budget games machine. TPG's Office system gains kudos for its three-year onsite warranty.

small, although it would be adequate for most purposes. Also included was a 56K internal modem, which only one other budget system squeezed in, and Lotus SmartSuite 97.

This PC provided plenty of bits and pieces per buck, but it was decidedly short on grunt. The Ziff-Davis CPUmark32 test placed the 300MHz AMD processor between a 333MHz Celeron and a 333MHz Pentium II in number-crunching ability, which was rather impressive considering the relative prices of these processors. However, the other performance indicators were not so good. Even though DirectX 6.0 is optimised for AMD's 3DNow instruction set, this system was at a definite disadvantage in graphics terms. The Matrox Millennium G200 display card should have placed this system near the top of the 2D and 3D graphics performance scale, but its Ziff-Davis 3D WinBench score was unimpressive and its scores in the Business and High-End Graphics WinMark 98 tests were just on the good side of average.

The 5.1G Quantum Fireball EL was a popular choice for the budget systems in this review and was an average performer in the Ziff-Davis Business and High-End Disk WinMark 98 tests. This system was at

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the lower end of PCs with the same hard disk drive, most likely due to processor or motherboard differences.

Although its performance was lacking in a few areas, this is one budget system you could buy off the shelf and start working with straight away, without having to pay for extra components.

Josh Mehlman

- **Distributor** Also Technology
- **Phone** (02) 9519 4600
- **Online** <http://www.alsotech.com.au/>
- **Price** \$1,990
- **In short** An awful lot is packed into this budget PC.

ClipperPro

BEYOND COMPUTERS

This was the cheapest system in our roundup. It was \$100 less than most of the other systems and still packed some good hardware for the price. Beyond Computers did not take the Celeron budget machine path, nor did it aim as high as putting in a 350MHz processor. Instead it opted for the middle ground and used a 333MHz Pentium II, supported by the minimum standard 32M of SDRAM.



One way the price was kept down was by fitting out the system with a 3.2G Quantum Fireball hard drive, which was smaller than the 5.1G Fireball drives sported by half the budget systems here. This didn't hinder it at all in the Ziff-Davis tests, however; in fact it performed admirably against the better configured machines like the Alpha PII-350 and Pioneer 98 SOHO PII-350 (both of which had Pentium II 350MHz processors).

It finished in the top three positions in most of the Ziff-Davis tests, and even came first in the Business Disk WinMark 98 test with a score that would also have beaten half of the ultimate consumer machines.

For multimedia it had a 32x LG CD-

How we tested

When testing these PCs, we used the Ziff-Davis suite of desktop PC benchmark software, including the Winstone 98 and WinBench 98 applications. We also tested the systems for year 2000 compliance using Check 2000 from Greenwich Mean Time. This piece of software analyses the relevant aspects of a computer's hardware and reports on whether it will be able to cope with the new millennium. Since all the machines we tested had relatively recent BIOS versions, they were all reported to be Y2K compliant.

Winstone 98 runs a suite of modern business and high-end processor-intensive and graphics applications. The run of these applications is timed to measure how long the system takes to complete these tasks. The Winstone benchmark is split into two tests: the High-End Winstone 98 and Business Winstone 98.

Earlier versions of the Winstone suite allowed us to run both the Business and High-End tests on systems that met the necessary memory requirements. Winstone 98, however, requires Windows NT 4.0 to run the High-End Winstone test, which tests the system using intensive graphics applications. All of the systems tested ran Windows 98; therefore we did not run the High-End Winstone test application.

The **Business Winstone** result is a comparative score of how fast the computer could complete the various business applications.

WinBench 98 contains a set of subtests designed to find out how fast each component of a PC really is.

Business and High-End Graphics

ROM drive, a PC Partner AGP video card (based on the Intel i740 chip) and a PC Partner SoundPro 3D card. The sound was not too bad, but the multimedia speakers that came bundled with the system were average and didn't give the full effect of 3D sound. The video quality was much better, capable of handling 3D and 2D processing with ease and appearing quite crisp on the 15in Teac monitor.

The CPU casing had a pleasant design outside and featured a lot of spare room inside. The motherboard had two ISA slots, three PCI slots and one shared ISA/PCI slot, so it's ideal for tinkerers or upgraders.

Darren Ellis

WinMark 98 measures the system's graphics performance when performing video tasks associated with common business applications, as well as demanding multimedia and 3D applications.

Business and High-End Disk

WinMark 98 provides a measure of how a system's hard disk subsystem handles a load equivalent to that demanded by the business applications used in the Business Winstone 98 test. Note that some systems use the Intel Bus Master driver to improve hard disk performance. This driver under some circumstances inflates the Disk WinMark figure, providing an inaccurate result.

CPUMark32 compares the speeds of the processor, memory and cache subsystems.

CD-ROM WinMark 98:Overall tests the CD-ROM drive, adapter and software drivers. The result is an overall measure of how fast the CD-ROM components transfer data.

All of the systems tested were shipping versions available to the general public, unless otherwise stated. Because of the lead time between testing the machines and publication, please note that some specifications and pricing may have changed. Be sure to check this information with the vendor before purchase.

Note: These tests were performed without independent verification by Ziff-Davis and Ziff-Davis makes no representation or warranties as to the results. WinBench and Winstone are registered trademarks of the Ziff-Davis Publishing Company. These benchmarks are available for you to try and buy at the Ziff-Davis Web site at <http://www.zdbop.com/>.

- **Distributor** Beyond Computers
- **Phone** (02) 9417 3688
- **Online** <http://www.beyondcomputers.com.au/>
- **Price** \$1,890
- **In short** A good-looking system with decent performance.

Expert Entertainer

DATAWELL

When we first checked out the Expert Entertainer, we wondered if there was some sort of mistake. What on earth was a Voodoo 2 card doing in a budget system? But somehow Datawell managed to fit a Voodoo 2 card in this PC and still keep the



DiamondMax Plus 2500
August '98



July '98



June '98



May '98



April '98



February '98

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price \$100 below the \$2,000 maximum for this category.

Of course, in order to fit in a 3D accelerator card, some sacrifices had to be made. The first thing to go was the processor. A 300MHz AMD K6-2 3D processor replaced the more standard Pentium II or Celeron. The RAM was kept down to 32M and the hard disk drive was rather small by today's standards at 3.2G. The 2D display card used a lower-end S3 controller chip, and no modem was included. The soundcard and speakers were also at the



budget end of the scale, but the sound was reasonable.

The aim of this configuration was quite clear. The more demanding games work very well independent of the processor speed or RAM size, provided a 3D accelerator card is present.

Games like Unreal and Need for Speed III looked almost as good on this system as they did on some of the ultimate systems with much faster processors and more RAM, because the vast majority of work was done by the 3D card. Its 15in monitor was particularly pleasant to look at.

If you want to look at this machine in terms of overall performance, things aren't so good. Aside from 3D performance, this system was a consistently low scorer in our tests, usually fighting with the Edge Technology KTX MX300 for last place.

Even its Ziff-Davis 3D WinBench score was only average, despite the Voodoo 2 card. It should be remembered that 3D WinBench is a measure of Direct3D performance only, and that many games are optimised to use the Voodoo 2's Glide API rather than Direct3D.

Josh Mehlman

■ Distributor	Datawell
■ Phone	(02) 9748 8688
■ Price	\$1,899
■ In short	A budget machine for gamers without deep pockets.

KTX MX300

EDGE TECHNOLOGY

This system came packed in a minitower case that was a lot smaller than any we've seen for a while. Inside, things looked a bit tight, but there were lots of free slots and just enough room to manoeuvre any expansion cards in. Only one of each of the three ISA and four PCI slots was occupied — by a Creative Labs AWE64 ISA card and an S3 Virge/DX PCI video card.

This was the only system we reviewed that featured an IBM processor, the 6x86MX PR300. These chips are similar to the Intel MMX and AMD K6 chips in that they carry special instructions for multimedia processing. As has been widely noted, however, the performance of the 6x86MX leaves a little to be desired.

The Ziff-Davis test results indicate that this system is more suited to business applications that require little graphics work — word processing, for example. As this machine was not designed for gam-



ing, it rated poorly in the Ziff-Davis 3D tests. In comparison to the other nine budget systems, the KTX MX300 was either at or near the bottom of the list in every case. This was also the only system that opted for a PCI video card over an AGP-powered adapter, which had a great bearing on the other graphical tests.

A definite plus at this price point was the inclusion of a Zip 100 drive. Another bonus was the quality of sound afforded by the AWE64 soundcard and KTX multimedia speakers. The powered speakers provided quite crisp sound at reasonable volumes and featured treble, bass and a passable surround-sound function. The monitor was a no-frills affair, also from KTX, but was more than enough for the SOHO user.

Darren Ellis

■ Distributor	Edge Technology
■ Phone	(02) 9353 9200
■ Online	http://www.edge.net.au/
■ Price	\$1,999

■ In short

A no-frills, no-fuss system without the bells and bobs for those who do not want them.

Diamond 2000

LANDMARK COMPUTERS

Although they were housed in the same casing and were based on the same motherboard, the two Landmark systems (budget and ultimate) were miles apart in terms of features and performance. The Diamond 2000 had an Intel 333MHz Celeron processor instead of the heftier Pentium II that the ultimate machine was based around, but the 2000 received a boost via the inclusion of 64M of SDRAM.

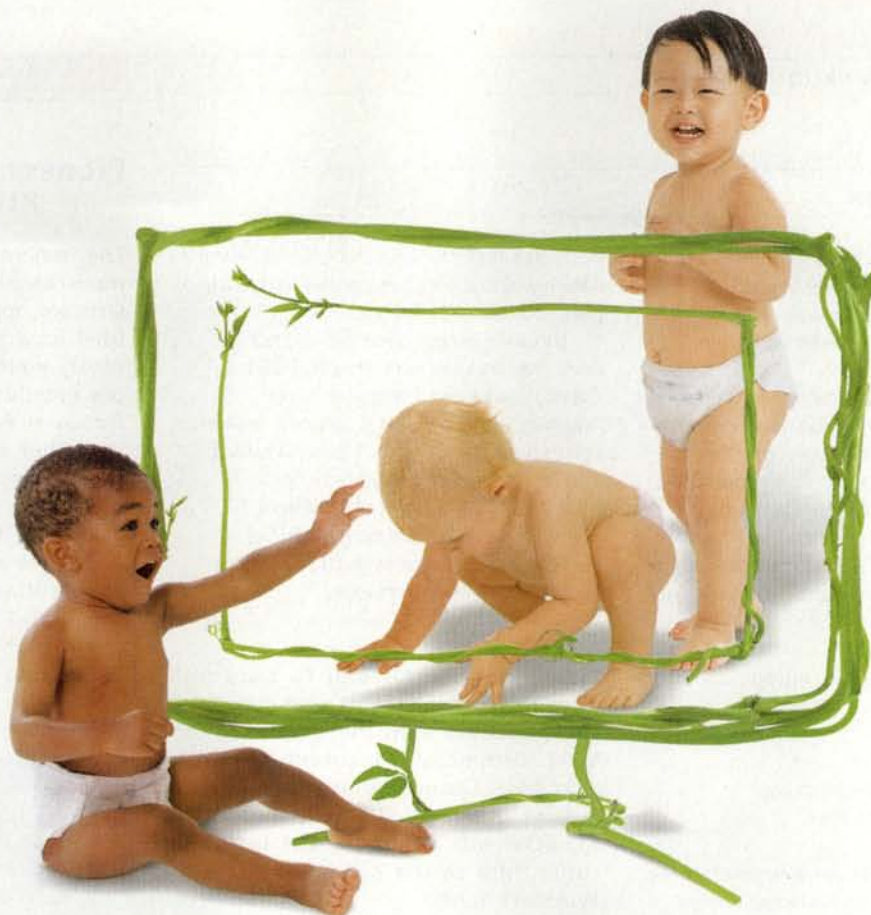
The motherboard came with three PCI slots, one ISA and one shared PCI/ISA slot, plus four 5.25in and two 3.5in drive bays, which is more than enough for any future upgrades. The casing also leaves users with plenty of room to manoeuvre parts around inside. For multimedia there was a Sound Blaster Vibra16 soundcard and an Intel i740-based video card that's good, but not the best you can get. The LG StudioWorks 57i monitor offered nothing fancy, but was one of the better monitors included with any of the budget machines.

The Diamond 2000 didn't quite have the oomph to beat the Pentium II systems, but held its own in the Ziff-Davis Business Winstone 98, Business Disk WinMark 98 and High-End Disk WinMark 98 tests. It had the third-highest 3D WinBench score but couldn't manage the same with the Business Graphics WinMark 98, High-End Graphics WinMark 98 and CPUmark32, where it came seventh. The 32x Acer CD-



ROM performed poorly — it had the second lowest score in Ziff-Davis CD-ROM WinMark 98:Overall test.

Ultimately, this machine is directed at the home gamer/enthusiast and is not as suitable for the SOHO user. We would recommend it for the budget-conscious gamer, as it offers all you would need now for a good price. However, you may find



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 ● Hyundai Electronics Asia Pte. Tel : 65-33-65-560 Fax: 65-33-65-911

The absentees

We invited a large number of vendors to submit PCs for these reviews, and although we were happy with the response, there are some notable absentees.

There were various reasons for vendors' non-participation. The most common was that the vendor was between product cycles, and unable to supply a product that would be available for sale to the public at the time of publication. It is a strict condition of APC reviews that machines submitted must be available for

purchase at the time of publication. Alternatively, some vendors agreed to participate, but never delivered.

Those we invited but which did not participate include: Acer, Auspac, Busi-Soft, Canda, Compcorp, Computers Direct Australia, Dick Smith, EPL Computer Services, Fujitsu Australia, Hallmark, Hewlett-Packard, IBM, Intelligent Printing Systems, Ipex, Microarts, Navada Computer Systems, NCC Systems, Neat TechnoCity, Packard Bell, Siemens-Nixdorf, Synnex Australia, Today Tech and Uni Tron Computer.

that you'd be wanting to upgrade it sooner rather than later.

Darren Ellis

■ Distributor	Landmark Computers
■ Phone	(02) 9585 9988
■ Price	\$1,999
■ In short	Above-average games machine at a good price, but lacking in some respects.

P-Plus C333

PERIPHERALS PLUS

When a manufacturer is working to a budget for a PC, certain compromises have to be made to keep under the given price, particularly our rather miserly \$2,000 limit. A common choice is between a powerful business machine with no frills, and a machine that's all frills with not much under the bonnet.

Peripherals Plus definitely leaned towards a business PC with this machine. The engine was a 333MHz Celeron processor, which was a popular choice in this category, and it came with 64M of RAM, which was more than most of the systems we reviewed. It had a reasonably

large Quantum Fireball EL hard disk drive (5.1G), which was also a popular choice. Rather than the usual 32x CD-ROM, Peripherals Plus went for a 40x Acer drive. The additional expense seems to have been wasted here; although the CD-ROM was nominally the fastest, it came third in the Ziff-Davis CD-ROM WinMark 98 test.

So far, this configuration is a solid basis for a business system, and this PC should have no trouble with business or Web applications. But if you wanted to use it to play games, watch video or work with multimedia, you'd run into trouble.

For a start, the video card was a Trident 9850 with 4M of VRAM — most video cards now have 8M and some higher-end cards have 16. It scored right down the low end of the scale in the Ziff-Davis Business and High-End Graphics WinMark 98 tests, and its 3D WinBench score of 281 was dismal, although not the worst in this review. Its soundcard and speaker combination sounded tinny and was not very pleasant to listen to. If you care about sound quality, it's probably best to give this one a miss. But if you want a budget business PC that has sound, it's a pretty good choice.

The P-Plus C333 came with Norton AntiVirus and Lotus SmartSuite 97 installed, and has a three-year RTB warranty. For an extra \$150, Peripherals Plus will make it an onsite warranty. If you're looking for a PC that is easy to work with but isn't much fun, you can't go wrong here.

Josh Mehlman

■ Distributor	Peripherals Plus
■ Phone	(02) 9630 3166
■ Online	http://www.perplus.com.au/
■ Price	\$1,995
■ In short	A good budget business PC with no frills.

Pioneer 98 SOHO PII-350

PIONEER COMPUTERS

The Pioneer system submitted for the ultimate category aced most of the Ziff-Davis tests we applied. The 98 SOHO PII-350 tried hard to emulate that success, and nearly pulled it off too. This system was one of only two in the budget category to feature a Pentium II 350MHz processor; the other was the Alpha PII-350. The processor wasn't the only point of similarity though — they both had a Diamond Stealth II G460 graphics card.

For the most part, it seemed to be a competition between this system and the Alpha for first place. The Pioneer came first in the Ziff-Davis 3D WinBench test, beating the Datawell Expert



Entertainer's 3D card/Voodoo2 combination by a long mile and just triumphing over the Alpha. In the other Ziff-Davis graphics tests it came first to the Alpha's second placing. It also came first in the Ziff-Davis CPUmark32 test and held a clear lead over the Alpha and the rest of the pack, which is a good indicator of the difference the motherboard brand makes. Its score here was higher than the bottom two ultimate category machines.

The Pioneer system came with an average amount of storage space — 4.3G on an IBM hard drive. It came away with good Business Disk WinMark 98 and High-End Disk WinMark 98 scores, and was beaten only by three Quantum Fireball drives. The 32x Panasonic CD-ROM drive only rated fourth in the Ziff-Davis tests, well behind the first-placed Alpha.

This system didn't come with any pre-installed software apart from Windows 98. The monitor was a 15in Daewoo that produced crisp, clear graphics but was a bit disappointing considering the graphical oomph of the machine. All up, we



feel this system would be great for business, and the CPU, disk and graphic capabilities mean that it would be equally adept as a basic home machine. **Darren Ellis**

■ Distributor	Pioneer Computers
■ Phone	(02) 9690 2888
■ Online	http://www.pioneercomputers.com.au/
■ Price	\$1,999
■ In short	Great performance from a tidy system.

TPG Office

TOTAL PERIPHERALS

The Total Peripherals Group provides a number of services to corporate customers, one of which is the provision of PCs. This is a PC targeted at the office worker, not the gamer. Consequently, it is a no-frills offering, but it does come with a superior support agreement — three years onsite.

Actually, most office workers would be more than pleased with this PC, in spite of its chunky desktop case. With a 333MHz Pentium II processor, 64M of SDRAM and

a 4G hard disk, the TPG Office was no slouch when it came to performance, although poor multimedia subsystems (no sound, poor video card) mean it's not going to be much use for after-hours Quake sessions.



In the Ziff-Davis benchmarks, the TPG system did fairly well in the important Winstone 98 test, scoring 23.7, but when we profiled the subsystems using Win-

Bench some holes appeared. Its 3D graphics performance was very poor (not surprising considering the use of an S3 Trio chip), as was its disk performance in both the High-End and Business Disk WinMark tests. Its 2D graphics performance was slightly above average, although its CD-ROM performance was a little below average.

The system was provided with a crummy 15in monitor, which was no real surprise at this price. The real surprise was that no network interface card was provided, which is poor for a system touted as an office PC. Presumably, it wouldn't cost too much to add a good old 10Base2/10BaseT combo card.

Apart from that, however, the TPG is a perfectly utilitarian system, well suited to corporate use and provided with an excellent onsite warranty.

Nathan Taylor

■ Distributor	Total Peripherals
■ Phone	(02) 9850 0800
■ Online	http://www.tpg.com.au/
■ Price	\$1,995
■ In short	A handy office system with a good warranty.

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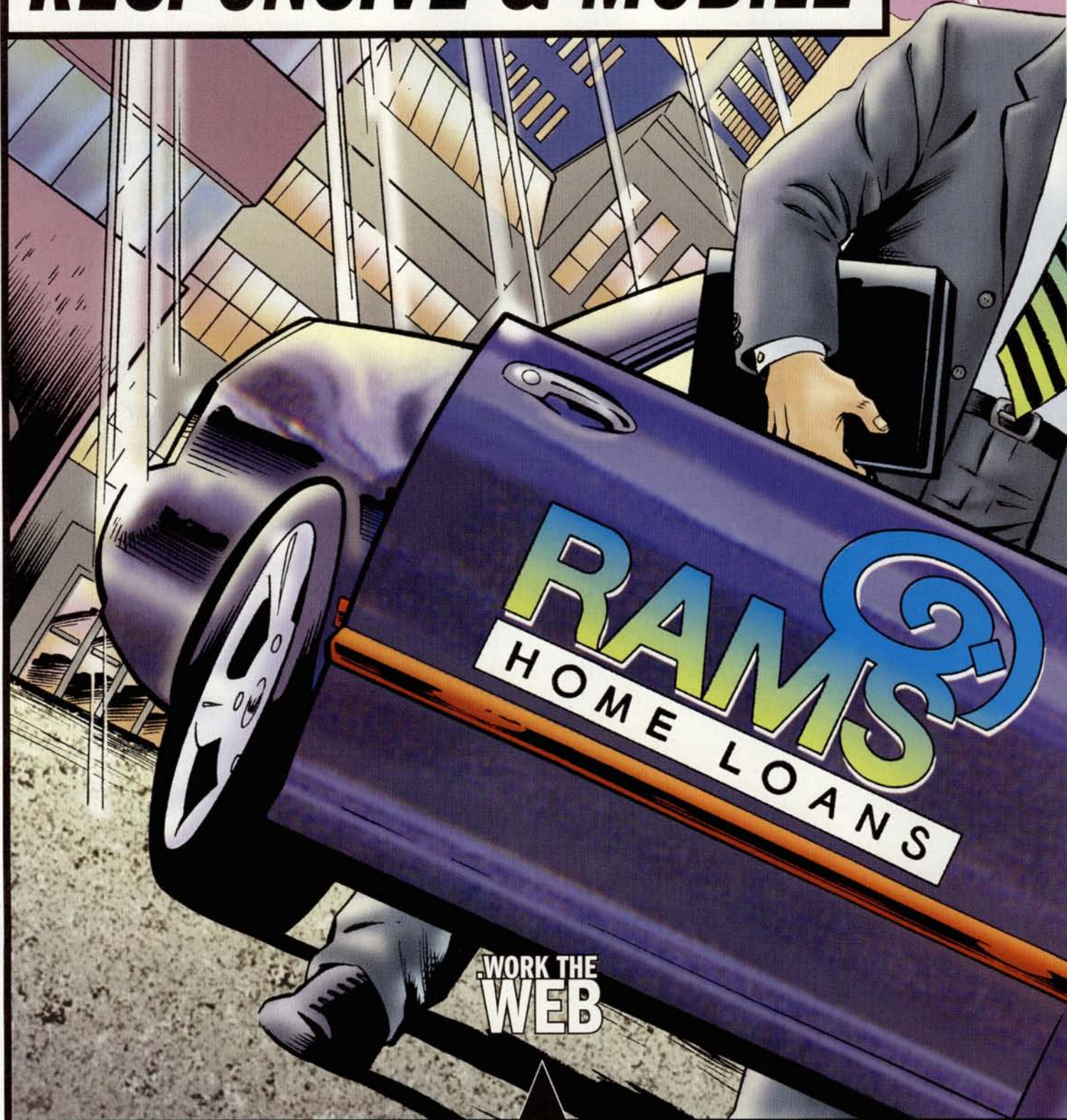
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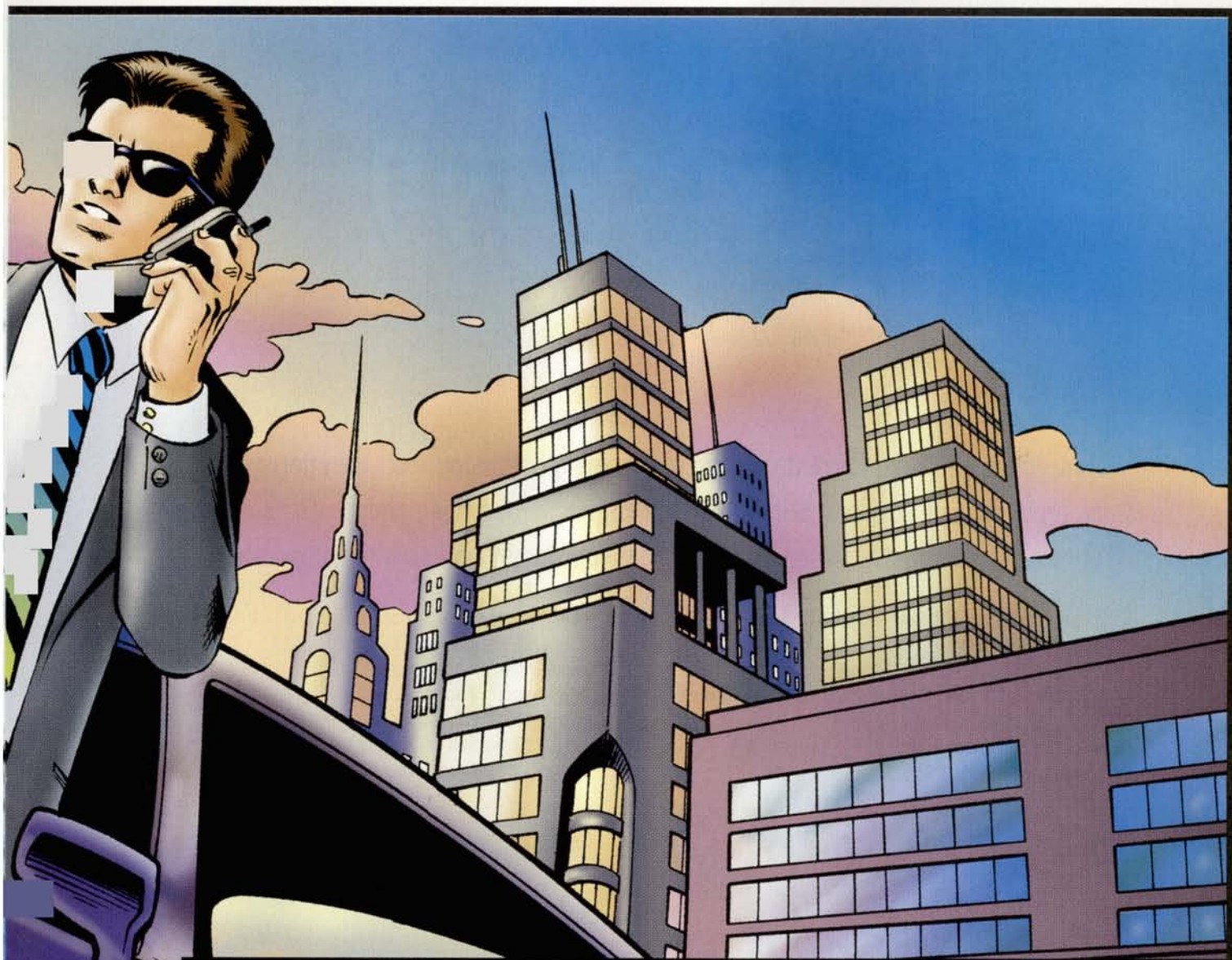
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Results: Business Winstone 98

	0	30
Alpha PII-350		26.8
Pioneer 98 SOHO PII-350		26.4
Beyond ClipperPro		24.6
TPG Office		23.7
Landmark Diamond 2000		23.6
Peripherals Plus C333		23.5
Adelong Advantage Celestial MP333		22.9
Also Technology Vogue Challenger 300MHz		22.9
Edge Technology KTX MX300		20.6
Datawell Expert Entertainer		20

Results: 3D WinBench

	0	1,200
Pioneer 98 SOHO PII-350		1,060
Alpha PII-350		1,030
Landmark Diamond 2000		927
Beyond ClipperPro		871
Adelong Advantage Celestial MP333		868
Datawell Expert Entertainer		839
Also Technology Vogue Challenger 300MHz		817
Peripherals Plus C333		281
TPG Office		142
Edge Technology KTX MX300		56.9

Results: Business Graphics WinMark 98

	0	200
Pioneer 98 SOHO PII-350		184.7
Alpha PII-350		174.7
Adelong Advantage Celestial MP333		157.3
Beyond ClipperPro		155
TPG Office		151.3
Also Technology Vogue Challenger 300MHz		146.7
Landmark Diamond 2000		145.7
Peripherals Plus C333		133.7
Datawell Expert Entertainer		124.3
Edge Technology KTX MX300		109.3

Results: High-End Graphics WinMark 98

	0	250
Pioneer 98 SOHO PII-350		229
Alpha PII-350		215
TPG Office		189.3
Also Technology Vogue Challenger 300MHz		188
Adelong Advantage Celestial MP333		184
Beyond ClipperPro		181
Landmark Diamond 2000		170.7
Peripherals Plus C333		158
Datawell Expert Entertainer		154
Edge Technology KTX MX300		135

Results: CD-ROM WinMark 98: Overall

	0	2,000
Alpha PII-350		1,940
Beyond ClipperPro		1,800
Peripherals Plus C333		1,773.3
Pioneer 98 SOHO PII-350		1,666.7
Adelong Advantage Celestial MP333		1,656.7
TPG Office		1,653.3
Edge Technology KTX MX300		1,636.7
Also Technology Vogue Challenger 300MHz		1,520
Landmark Diamond 2000		1,416.7
Datawell Expert Entertainer		1,345.7

Results: CPUmark32

	0	1,000
Pioneer 98 SOHO PII-350		975.7
Alpha PII-350		933.7
Beyond ClipperPro		836.3
TPG Office		830
Also Technology Vogue Challenger 300MHz		734.3
Peripherals Plus C333		649.7
Landmark Diamond 2000		643.3
Adelong Advantage Celestial MP333		631.3
Datawell Expert Entertainer		624
Edge Technology KTX MX300		555

Results: Business Disk WinMark 98

	0	2,000
Beyond ClipperPro		1,606.7
Alpha PII-350		1,520
Pioneer 98 SOHO PII-350		1,506.7
Landmark Diamond 2000		1,486.7
Adelong Advantage Celestial MP333		1,483.3
Also Technology Vogue Challenger 300MHz		1,466.7
Peripherals Plus C333		1,386.7
Edge Technology KTX MX300		1,366.7
Datawell Expert Entertainer		1,196.7
TPG Office		1150

Results: High-End Disk WinMark 98

	0	5,000
Alpha PII-350		4,326.7
Beyond ClipperPro		4,186.7
Landmark Diamond 2000		4,186.7
Pioneer 98 SOHO PII-350		4,150
Also Technology Vogue Challenger 300MHz		4,113.3
Adelong Advantage Celestial MP333		3,966.7
Peripherals Plus C333		3,953.3
Edge Technology KTX MX300		3,763.3
TPG Office		3,223.3
Datawell Expert Entertainer		3,213.3

The use of the Intel BusMastering hard disk driver on systems using Ultra-DMA hard drives may report incorrectly high scores in the Ziff-Davis WinBench Business Disk WinMark 98 and High-End Disk WinMark 98 tests. Some of the systems in this review may report such results.

The use of the Intel BusMastering hard disk driver on systems using Ultra-DMA hard drives may report incorrectly high scores in the Ziff-Davis WinBench Business Disk WinMark 98 and High-End Disk WinMark 98 tests. Some of the systems in this review may report such results.

Specifications: Budget PCs

Product	Advantage Celestial MP333	Alpha PII-350	Vogue Challenger 300MHz	ClipperPro	Expert Entertainer
Distributor	Adelong Computers	Alpha Computer	Also Technology	Beyond Computers	Datawell
Phone	1800 626 345	(03) 9415 9177	(02) 9519 4600	(02) 9417 3688 or (03) 9646 4388	(02) 9748 8688
Fax	(02) 9669 3216	(03) 9415 9188	(02) 9550 6583	(02) 9417 3699	(02) 9748 8677
Online	http://www.adelong.com.au/	http://www.alphacomputer.com.au/	http://www.alsotech.com.au/	http://www.beyondcomputers.com.au/	—
Price	\$1,995	\$1,999	\$1,990	\$1,890	\$1,899
Specifications					
Processor	Intel Celeron 333MHz	Intel Pentium II 350MHz	AMD-K6 3D 300MHz	Intel Pentium II 333MHz	AMD K6-2/3D 300MHz
Tested/maximum RAM (M) and type	32/256/SDRAM	64/1024/SDRAM (PC100)	64/384/SDRAM	32/384/SDRAM	32/384/SDRAM
Secondary cache (K)	128	128	512	512	512
Hard disk	5.1G Quantum Fireball EL5.1A	5.1G Quantum Fireball EL5.1A	5.1G Quantum Fireball EL5.1A	3.2G Quantum Fireball	3.2G Quantum Fireball
Hard disk controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	VIA Bus Master PCI IDE Controller (Ultra DMA)	Intel 82371AB/EB PCI Bus Master IDE Controller	VIA Bus Master PCI IDE Controller (Ultra DMA)
Hard disk file system	FAT32	FAT32	FAT32	FAT32	FAT32
Graphics card	Diamond Stealth II G460	Diamond Stealth II G460	Matrox Millennium G200	Intel i740-854	S3 Virge Gx2/APAC Voodoo2
Video bus type	AGP	AGP	AGP	AGP	AGP
Video RAM	8M	8M	8M	8M	4M
Video controller chip	Intel i740	Intel i740	MGA-200	Intel i740	S3/3Dfx Voodoo2
Graphics driver name and version	s2g460le.drv (4.10.01.1338)	s2g460le.drv (4.10.01.1346)	mgapdx64.drv (4.10.01.4210)	gfxdrv.drv (4.10.01.1927)	s3_3.drv (4.10.01.2113)
Monitor	15in Mitsubishi Diamond View 15554	15in Philips	14in Acer View 34-E	15in Teac	15in Videocom
Tested resolution/colour depth/refresh rate	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz
CD/DVD-ROM drive	32x Matsushita CR-588	36x Pioneer CD-ROM DR-A14S	32x Mitsubishi	32x LG CD-ROM CRD-8322B	32x Diamond Data
Soundcard	ESS 16-bit	Sound Blaster 16	Atrend	PC Partner SoundPro 3D	DataExpert
Modem	No	No	56K internal	No	No
OS available	Windows 98	Windows 98	Windows 98	Windows 98	Windows 98
Warranty	3 years onsite parts and labour Australia wide	RTB, 2 years parts, 5 years labour	2 years RTB parts, 5 years labour	RTB 2 years parts, 5 years labour	2 years onsite parts and labour
Bundled software and accessories	Vet AntiVirus and Altec Lansing ACS91 multimedia speakers	Norton AntiVirus, PC Alert and Nicole multimedia speakers	IBM AntiVirus, Lotus SmartSuite 97	Nicole multimedia speakers	Lotus SmartSuite 97, Nicole multimedia speakers
3D disclosure information					
DirectX version	6.0	6.0	6.0	6.0	6.0
Flat shading/Gouraud shading	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Dithering/Z-Buffer	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Perspective correction	Capable	Capable	Capable	Capable	Capable
Nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Nearest mipmap nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Linear mipmap nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Modulate/Decal texture blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
DecalAlpha/ModulateAlpha texture blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Flatwrap texture addressing	Capable	Capable	Capable	Capable	Capable
Cylindrical wrap u/Wrap v	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Clamp/Mirror texture addressing	Capable/Capable	Capable/Capable	Capable/Not capable	Capable/Capable	Capable/Not capable
Cull counterclockwise/Cull clockwise	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Cull none	Capable	Capable	Capable	Capable	Capable
Fog vertex linear/Fog table linear	Capable/Not capable	Capable/Not capable	Capable/Capable	Capable/Not capable	Capable/Capable
Fog table exponential/Specular highlights	Not capable/Capable	Not capable/Capable	Capable/Capable	Not capable/Capable	Capable/Capable
Colour key/Alpha transparency	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Source alpha/Add pixel blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Modulate pixel blending/Alpha vertices	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Fog vertex and colour key	Capable	Capable	Capable	Capable	Capable
Fog vertex and alpha	Capable	Capable	Capable	Capable	Capable
Anti-aliasing/Texture swapping	Capable/Capable	Capable/Capable	Incorrect/Capable	Capable/Capable	Not capable/Capable
Narrow z/Wide z accuracy	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect
High triangle count/Texture fidelity	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable

1. 'Incorrect' means that while a card's drivers claimed to support a certain feature, under our testing conditions the card was found to perform this feature incorrectly.

2. All products used in these tests are shipping versions available to the public at the time of publication, unless otherwise stated.

3. Winstone, WinBench and associated programs are registered trademarks of the Ziff-Davis Publishing Company.

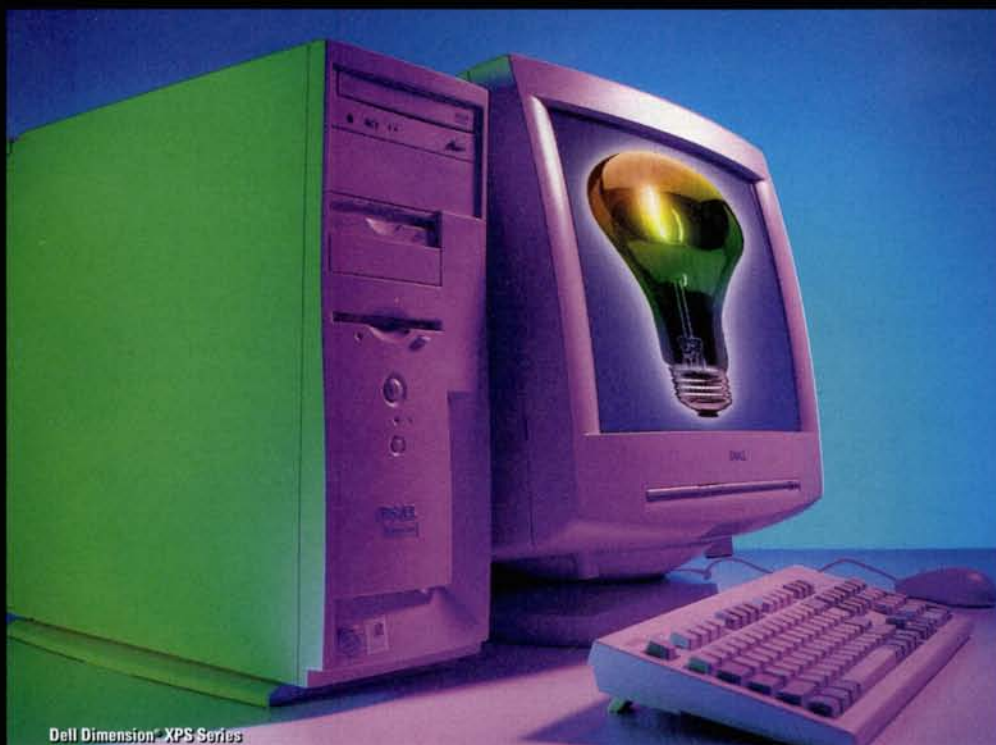
4. These tests were performed without independent verification by Ziff-Davis, and Ziff-Davis makes no representations or warranties as to the results of the tests.

5. The Vogue Challenger, ClipperPro, Expert Entertainer and KTX systems could not run tests at 1,024 by 768 by 256K colours. A resolution of 1,024 by 768 by 64K colours was used instead.

6. The above specifications refer to the actual machines tested by APC Labs. Check with the vendors for the latest components.

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DELL00056/DECA/APC/SMA

Specifications: Budget PCs

Product	KTX MX300	Diamond 2000	P-Plus C333	Pioneer 98 SOHO PII-350	TPG Office
Distributor	Edge Technology	Landmark Computers	Peripherals Plus	Pioneer Computers	Total Peripherals
Phone	(02) 9353 9200	(02) 9585 9988	(02) 9630 3166	(02) 9690 2888	(02) 9850 0800
Fax	(02) 9353 9222	(02) 9579 4554	(02) 9630 3167	(02) 9690 0333	(02) 9878 3877
Online	http://www.edge.net.au/	—	http://www.perplus.com.au/	http://www.pioneercomputers.com.au/	http://www.tpg.com.au/
Price	\$1,999	\$1,999	\$1,995	\$1,999	\$1,995
Specifications					
Processor	Cyrix 6x86MX-PR266	Intel Celeron 300MHz	Intel Celeron 333MHz	Intel Pentium II 350MHz	Intel Pentium II 333MHz
Tested/maximum RAM (M) and type	64/128/DRAM	64/384/SDRAM	64/768/SDRAM (PC100)	32/768/SDRAM (PC100)	64/1024/SDRAM (PC100)
Secondary cache (K)	512	128	128	512	512
Hard disk	3.4G Maxtor 90340D2	5.1G Quantum Fireball EL5.1A	5.1G Quantum Fireball EL5.1A	5.1 G Quantum Fireball EL	4.3G Seagate ST34321A
Hard disk controller	ALI M5229 PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller
Hard disk file system	FAT32	FAT32	FAT32	FAT32	FAT32
Graphics card	S3 VirgeDX/Gx PCI (375/385)	Diamond Stealth II G460	Trident 3DImage 9850 (AGP v445/h)	Diamond Stealth II G460	S3 Trio3D
Video bus type	PCI	AGP	AGP	AGP	AGP
Video RAM	4M	8M	4M	8M	4M SGRAM
Video controller chip	S3	Intel i740	Trident 9850	Intel i740	S3 Trio
Graphics driver name and version	s3v.drv (4.10.00.1681)	s2g460le.drv (4.10.01.1338)	sgiu98.drv (4.10.01.2139)	s2g460le.drv (4.10.01.1346)	s3_4.drv (4.10.01.2203)
Monitor	15 in KTX CAE-564SGC	15in LG StudioWorks	15in Daewoo 518x	15in Daewoo 518x	15in TPG 1569SE
Tested resolution/colour depth/refresh rate	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz
CD/DVD-ROM drive	32x Mitsumi CD-ROM Fx320M	32x Acer	40x Acer	32x Matsushita CD-ROM CR-588	36x Diamond Data
Soundcard	Creative AWE64 16-bit Audio (SB16 compatible)	Sound Blaster Vibra 16	Ensoniq AudioPCI	Sound Blaster Vibra 16	—
Modem	No	56K internal ASVD Patrol	No	No	No
OS available	Windows 98	Windows 98	Windows 98	Windows 98	Windows 98
Warranty	2 years RTB parts and labour	RTB, 2 years parts, 5 years labour	3 years RTB or onsite for an extra \$150	2 years RTB parts and 5 years labour	3 years onsite parts and labour
Bundled software and accessories	Zip 100 drive, KTX SP-965 multimedia speakers	Lotus SmartSuite 97, multimedia speakers	Lotus SmartSuite 97, Norton AntiVirus, Nicole multimedia speakers	Multimedia speakers	—
3D disclosure information					
Directx version	6.0	6.0	6.0	6.0	6.0
Flat shading/Gouraud shading	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Dithering/Z-Buffer	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Perspective correction	Capable	Capable	Capable	Capable	Capable
Nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Nearest mipmap nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Linear mipmap nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Modulate/Decal texture blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Decal/Alpha/Modulate/Alpha texture blending	Capable/Incorrect	Capable/Capable	Capable/Incorrect	Capable/Capable	Capable/Not capable
Flatwrap texture addressing	Capable	Capable	Capable	Capable	Capable
Cylindrical wrap u/Wrap v	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Clamp/Mirror texture addressing	Incorrect/Not capable	Capable/Capable	Capable/Not capable	Capable/Capable	Not capable/Not capable
Cull counterclockwise/Cull clockwise	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Cull none	Capable	Capable	Capable	Capable	Capable
Fog vertex linear/Fog table linear	Capable/Not capable	Capable/Not capable	Capable/Not capable	Capable/Not capable	Capable/Not capable
Fog table exponential/Specular highlights	Not capable/Capable	Not capable/Capable	Not capable/Capable	Not capable/Capable	Not capable/Capable
Colour key/Alpha transparency	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Source alpha/Add pixel blending	Capable/Not capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Modulate pixel blending/Alpha vertices	Not capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Fog vertex and colour key	Incorrect	Capable	Capable	Capable	Capable
Fog vertex and alpha	Incorrect	Capable	Capable	Capable	Capable
Anti-aliasing/Texture swapping	Not capable/Capable	Capable/Capable	Not capable/Capable	Capable/Capable	Not capable/Capable
Narrow z/Wide z accuracy	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect
High triangle count/Texture fidelity	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable

1. 'Incorrect' means that while a card's drivers claimed to support a certain feature, under our testing conditions the card was found to perform this feature incorrectly.

2. All products used in these tests are shipping versions available to the public at the time of publication, unless otherwise stated.

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5. The Vogue Challenger, ClipperPro, Expert Entertainer and KTX systems could not run tests at 1,024 by 768 by 256K colours. A resolution of 1,024 by 768 by 64K colours was used instead.

6. The above specifications refer to the actual machines tested by APC Labs. Check with the vendors for the latest components.

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Ultimate SYSTEMS

In last year's Christmas issue we looked at the meanest machines around in the 'workstation PC' category, and only those packing considerable power qualified at the time. Here's what we mean: Pentium II 300MHz, 64M of SDRAM and up to 6.4G hard drives going for a 'mere' \$5,000+

(and in two cases \$10,000+!). Fortunately this Christmas, money like that will net you a hell of a lot more. And if you look at our budget category reviews, you'll find systems similar to last year's 'workstations' now priced under \$2,000.

The minimum requirements for this year's ultimate consumer category were: 64M of RAM, a CD-ROM drive, Windows 98, monitor, and a keyboard and mouse. We placed no other restrictions on the systems other than asking vendors to pack them out with whatever they wanted. We can't say that money was no object, because purchase price is still a factor.

We'd already had a taste of what could be done in this category when we reviewed the Gateway G6-450XL at APC Labs in early October, so we couldn't wait until the other 450MHz Pentium II machines arrived for this comparative review. We received a total of eight 450MHz-powered monsters, which accounted for nearly two-thirds of the ultimate systems in the review. The remaining systems came with



400MHz Pentium IIs, except for the Compaq Presario which clocked in with a 350MHz-chip.

It was great to see that almost half of the ultimate systems came with DVD-ROMs. We also saw a lot of great speaker systems — especially

those with two satellites and subwoofer combinations. We were blown away by the 3D capabilities of a few systems, in particular those with nVidia Riva TNT-based cards.

Something notable in all of the systems submitted was the absence of 21in monitors. Unlike CPUs, RAM and peripherals, monitors are notorious for having a relatively stable pricing structure due to the expense of manufacturing. There have been reductions, but the cost of a 19 or 21in monitor today is roughly comparable to the cost at this time last year. A large monitor can add lots of dollars to the price of a system, and obviously our vendors were wary of this fact. Only three were brave enough to include 19in monitors; the rest settled for 17in screens, apart from Compaq and Datawell, which kept their prices down with 15in displays.

All in all, the systems in these reviews are a good mix of powerful corporate performers and gamers' dream machines.

Darren Ellis

Advantage Multimedia MP450

ADELONG COMPUTERS

Although Adelong's Advantage Multimedia MP450 package was a near-perfect portrait of cutting-edge technology, its performance revealed the pen of a courtroom artist rather than the brushstrokes of a modern master. Throughout all our testing the machine's performance clung to a point just above the middle range of scores, never daring to distinguish itself in any way.

The MP450 was among a handful of machines bearing very similar configurations of core components which dominated the Ziff-Davis 3D WinBench and Business Winstone 98 scores. Business Winstone 98 provides a strong overall impression of how a system will perform in everyday use, but given that the variation among these scores was relatively small, to characterise the MP450 as



mediocre based on this alone would be a mistake. In the remaining tests, the performance of other machines in this dominant group fluctuated, while the MP450's results were steady.

The Seagate 6.5G hard disk didn't make the most stunning complement to an ultimate machine, and although it was one of the smaller disks on offer, there was no improved performance to compensate. This choice was probably made with cost in mind.

Nevertheless, this system was still arguably one of the best reviewed in terms of value for money. The core components included a 450MHz Pentium II, 64M of SDRAM, a 16M Diamond Viper V550 AGP card, a 17in monitor, an internal 56K modem and Altec Lansing's ACS45 speaker/subwoofer set — the last of these being a surprising addition to an otherwise lean performance system.

The case housed all of this easily, and had plenty of room for more. However, you'd have to take on the task of removing its front panel to gain access to the screws that hold the rear casing in place. We found this mysterious design awkward,

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and it added absolutely nothing to the case's function or appearance.

With a three-year return-to-base warranty and such a competitive price, this is a great all-round system for the demanding home user.

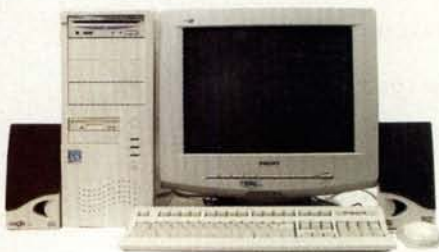
Andrew Colley

- **Distributor** Adelong Computers
- **Phone** 1800 626 345
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- **Price** \$3,590
- **In short** Average performance at a very good price.

Alpha PII-450

ALPHA COMPUTER

Alpha turned out an almost-terrific multimedia system in the PII-450. The installed trial version of Cakewalk brilliantly showed off the capabilities of the



Creative Labs Sound Blaster PCI 128 soundcard. The trayless Pioneer DVD-ROM could play full-screen video with ease, even on your TV, thanks to a Cinemaster DVD playback card. The 17in Philips monitor made it look terrific, especially combined with a Matrox Millennium G200 graphics card and a Diamond Monster 3D II accelerator; although having both in one system seemed to be almost overkill. The only problem was the whole thing didn't sound particularly good because the speakers were of the cheap-and-nasty variety. You would think that when you're forking out more than \$4,500 for a multimedia PC, a pair of halfway decent speakers would be in order.

The Alpha's case was rather bland on the outside, and the back connectors were not labelled at all, which would make it very difficult for inexperienced users to set up the PC for the first time. Experienced users would also have some niggles, especially as the case was rather difficult to open. While there was plenty of free space inside the case, only one of the PCI slots was left free with the sound,

graphics, 3D accelerator and DVD playback cards in place. Of course, once you've included all these, most people would be hard-pressed to name another two PCI cards that they would want to add.

Alpha's graphics performance was excellent, which shouldn't surprise anyone. Its 10.1G IBM hard disk drive was impressive in the Ziff-Davis Business and High-End Disk WinMark 98 tests. The 450MHz Pentium II processor came second in the CPUmark32 test, despite having only having 64M of RAM to work with.

Alpha included some useful bundled software, including Lotus SmartSuite 97 and Norton AntiVirus. The Alpha also came with an internal 56K modem. It's so close to a dream games or multimedia machine, you could always plug it into your hi-fi.

Josh Mehlman

- **Distributor** Alpha Computer
- **Phone** (03) 9415 9177
- **Online** <http://www.alphacomputer.com.au/>
- **Price** \$4,590
- **In short** Falls just short of a dream multimedia machine.

Vogue Performer II 400MHz

ALSO TECHNOLOGY

Given it contained only a 400MHz Pentium II processor and 64M of RAM, it's hardly surprising that the Vogue Performer achieved only average and below-average results in our tests. But at a cost of only \$3,385, the Vogue is an excellent value proposition.



The Vogue Performer scored 27.4 in Ziff-Davis' Business Winstone 98, putting it 11th in the review group. A quality video card, the 8M Matrox Millennium G200, provided it with better scores in the Ziff-Davis graphics tests however, placing it in the middle of the



EDITOR'S CHOICE

● Pioneer 98 Professional PII-450

HIGHLY COMMENDED

● Dell XPSR-450

Pioneer's 98 Professional PII-450 was the obvious Editor's Choice for this category. It topped all but one of the Ziff-Davis tests, most of them by a notable margin. It is inexpensive, feature-packed, and somehow squeezed a few extra percentage points out of the already amazing Riva TNT graphics chip.

Pioneer's PC had some pretty good components, but some of the other systems in this category offered even better features. Gateway's G6-450XL was packed with everything you could ever want, but was too expensive, especially considering its performance was not as hot as some other systems. TPG's Ultra Office — a misnomer if ever we heard one — was also packed with features.

The Dell XPSR-450 had some terrific components as well; its audio subsystem was particularly impressive. However, a poor choice of graphics card left it with some unimpressive scores in graphics testing. Since Dell allows you to configure your own system, you could always pay a little extra and swap the graphics card for a Riva TNT-based card.

pack in 3D WinBench and both Graphic WinMark benchmarks. The performance of the 5.1G Quantum disk drive was also about average in Business Disk WinMark 98, and a bit above average in the High-End Disk WinMark 98 test. The 32x CD-ROM produced decent results in the Ziff-Davis test, placing it seventh in the group.

It was not a terribly pretty machine, but then no other vendors featured in these reviews seem to have cottoned on to the need for good case design either. A rather good 17in monitor provided output, as did a Creative Labs Sound Blaster AWE64 soundcard with two speakers. While the latter was no longer state of the art (being an ISA-based solution), it did provide excellent compatibility with DOS games. For connectivity, a 56K internal modem was installed, as was something that was unique to the Vogue:

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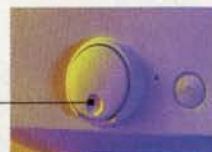
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98APDET

a Fast Ethernet card. While it's nice to have the latest networking technology, a gamer might be better served by a combo 10Base2/10BaseT card, which provides support for coaxial connections, obviating the need for a hub in the home. Of course, it is unlikely that Also Technology would complain if you asked to swap.

Like so many PCs these days, the Vogue Performer was bundled with Lotus SmartSuite 97 and IBM's virus checker. A two-year parts, five-year labour RTB warranty applies to the system.

Nathan Taylor

■ Distributor	Also Technology
■ Phone	(02) 9519 4600
■ Online	http://www.alsotech.com.au/
■ Price	\$3,385
■ In short	Not the flashiest system in the review, but great value.

SuperO P2 Speedo BEYOND TECHNOLOGY

We thought the server casing on the Beyond system was overkill — it came complete with space for an additional power supply, plus six 5.25in and two 3.5in drive bays, and only one of each was taken up by the 32x CD-ROM and floppy drive. An advantage here was that there was enough room left inside to swing a very large cat, but you'd still have to find somewhere to put the system in the first place. We recommend hiding it under a desk because the casing was rather ugly,

impressive third place with a score of 1,150 in the Ziff-Davis CPUmark32 test and second in the CD-ROM WinMark 98 test. In all of the Ziff-Davis graphics tests it was slightly edged out by the identically configured Alpha PII-450, but not by much.

In both of the Ziff-Davis 2D graphics tests it came third. It lost ground markedly in the High-End Disk WinMark 98 and Business Disk WinMark 98 tests, because it used a 5.1G Quantum Fireball hard disk instead of the larger drives of the competition.

Another bonus for those who appreciate good graphics was the 17in Sony Trinitron monitor with an almost flat screen. It may not have been the largest screen on offer in this roundup, but it was one of the best. Included with the system was a good subwoofer/satellite speaker combination that gave excellent sound from the Sound Blaster PCI 128 card. All in all, it was a gamer/SOHO machine masquerading as a purely corporate system. Don't be fooled by its looks.

Darren Ellis

■ Distributor	Beyond Technology
■ Phone	(02) 9417 4388 or (03) 9646 4388
■ Online	http://www.beyondcomputers.com.au/
■ Price	\$3,980
■ In short	Awful look, but great once you get under the bonnet.

Presario 5179

COMPAQ

While geeks may sneer at Compaq's Presario 5179 and call it a toy, this PC rivaled the iMac for its strong focus on less-experienced home users. But while the Presario's configuration was quite similar to that of the iMac, the additional \$1,500 payable for the Presario 5179 will keep it out of the price range of many home users.

The Presario 5179 came in a dinky baby tower case with brightly coloured stickers all over it. 'Expandable and upgradeable', said a sticker on the front. 'But not by you', said the case, which was rather difficult to open. 'Actually, maybe not at all', said the crowded interior of the case, giving a choice of either one ISA or one PCI expansion slot. A small plastic panel on the front of the case flipped up to reveal the Creativity Action Centre, which had a joystick port and two USB ports to plug in 'creative' peripherals. Unfortunately, some more common 'cre-

ative' devices such as a microphone and headphones still plugged into the back of the PC, although the monitor had a pretty good microphone built in.

The keyboard had a series of Easy Access Buttons which controlled the CD player and the volume. Just like a remote-control TV, the controls superimpose over the screen in big green letters. It also had a power button to put the computer into sleep mode, and buttons to launch your favourite applications such as email or your Web browser. Not



surprisingly, they were preset to take you to Compaq's Web site.

One of the cleverest features of the Presario was that it came with CarbonCopy remote control software installed. This allows Compaq's support staff to remotely access your PC via the Internet if you have trouble, find out what's going wrong with it, and fix the problem.

Despite the \$4,099 price tag, the Presario's configuration was closer to many of the budget PCs than the ultimate ones. It had a 350MHz Pentium II processor, 64M of RAM and a 6G hard disk drive. It came with some nice extras such as an internal modem, a Zip drive and a very impressive-sounding pair of speakers that hooked onto the sides of the monitor.

The Presario certainly isn't going to win any prizes for performance when compared with the other PCs in this category. It was a consistently low scorer in most of our tests. If you're the sort of person who finds data transfer rates exciting, you won't even want to look at the Presario. But if you're looking for a PC that's easy to set up and use, no matter what your level of PC experience, you're on a winner here.

Josh Mehlman

■ Distributor	Compaq Computer
■ Phone	1300 368 369
■ Online	http://www.compaq.com.au/
■ Price	\$4,099
■ In short	Easy and fun, terrific for first-time users.



and in a world full of dull, beige computers, that's saying something.

Aesthetics aside, you're left with a very good system. It had the near-ubiquitous 450MHz Pentium II processor, 64M of SDRAM and a Matrox Millennium G200 graphics card to back it up. Even with half the amount of RAM of some of the competition, it came an

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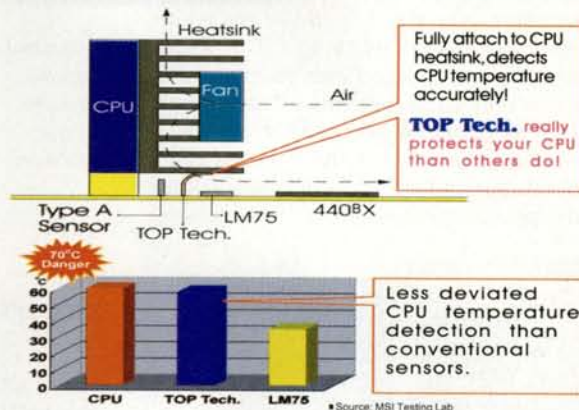
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PC Magazine Australia April, 1998

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- **Memory:** 4 DIMM. Max. 512MB, or 1GB registered SDRAM (Support ECC)
- **I/O:** 2 Serial, 1 Printer, 2 USB ports, Floppy, IrDA (register)
- **BIOS:** ACPI, DMI, PnP, Green
- **Slot:** 3 ISA, 4 PCI and 1 AGP. 30cmx22.5cm, ATX

MS-6119

Intel® 440BX AGPset ATX Mainboard

- **CPU:** Intel Pentium® II processor up to 450MHz or faster
- **Memory:** 3 DIMM. Max. 384MB, or 768MB registered SDRAM (Support ECC)
- **I/O:** 2 Serial, 1 Printer, 2 USB ports, Floppy, IrDA (register)
- **BIOS:** ACPI, DMI, PnP, Green
- **Slot:** 3 ISA, 4 PCI and 1 AGP. 30cmx18.6cm, ATX

MS-5169

Ali® Aladdin V AGPset ATX Mainboard

- **CPU:** 75-300MHz or faster Pentium® Processor with MMX™ Technology, AMD K6/K6-2, Cyrix M2, IBM 6x86 processor
- **Clock:** Support up to 100MHz
- **Memory:** 3 DIMM. Max. 768MB SDRAM(100MHz)
- **Cacheable Size:** 512MB
- **I/O:** 2 Serial, 1 Printer, 2 USB ports, Floppy, IrDA
- **BIOS:** ACPI, DMI, PnP, Green
- **Slot:** 3 ISA, 4 PCI, 1 AGP. 30cmx18.6cm, ATX



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Hyperion 2450

COMPUCON COMPUTERS

The Compucon Hyperion 2450 came with a curious mix of high and low-end equipment — a DVD-ROM, an LS-120 drive and a great set of speakers were the highlights, but it only came with the fairly standard 17in monitor and 64M of RAM. Overall, it tended towards the middle of the Ziff-Davis benchmarking results, which was a little disappointing for a system this expensive.



Bundled with the Matrox Millennium G200 card, the Compucon Hyperion 2450 fared well in most of the Ziff-Davis graphics tests, and given that it was bundled with a 2x DVD drive, it would make a reasonable multimedia system. It's worth noting that it came second last in the CD-ROM WinMark stakes, which reduced its multimedia capacity. The 17in monitor also limited its usefulness for multimedia, although only two other systems in this review shipped with larger monitors.

The Compucon Hyperion 2450 also came with a couple of curious extras — an infra-red keyboard and mouse. This definitely had elements of sheer gimmickry: very few people working at a desktop have reason to move the keyboard much, and there's the ever-present problem of keeping batteries charged for it. While in theory this would be good for presentations, its functionality is otherwise a little limited.

The sound on the system was definitely a high point — the speakers were clear and crisp, the subwoofer great. However, the volume control for the monitor speakers was built into a single dial used to adjust all the monitor's display settings, which could prove a little annoying after a while.

The system came bundled with a Microsoft pack and a couple of DVD games. It was one of only two systems to come with a three year onsite parts and labour warranty.

Overall, the Compucon Hyperion 2450 was a reasonable but unexceptional sys-

tem compared to the others reviewed here. Despite this, the price is right up there with the big brand-name vendors.

Alex Kidman

■ Distributor	Compucon Computers
■ Phone	(02) 9417 7166
■ Online	http://www.compucon.com/
■ Price	\$5,899
■ In short	Some great features, some gimmicks, but all a tad too expensive.

Expert Performance II

DATAWELL

For an ultimate system, the Expert Performance II certainly provided good value for money, but it wasn't really ultimate. Considering we left this category fairly open, Datawell was conservative, keeping the price and the specifications relatively modest. This system couldn't really compete with the higher-end systems in the ultimate category, such as Gateway's G6-450XL or Compucon's Hyperion 2450. But at half the price, it's unfair to make direct comparisons.



The Expert Performance II came in a large, unremarkable tower case with plenty of room inside for expansion. Inside was a 400MHz Pentium II processor and 64M of memory. The 4.3G Fujitsu hard disk drive was the smallest in this category, but this PC was also the cheapest. The Intel i740-based graphics card was far from brilliant, but was by no means the worst in this category according to the Ziff-Davis Graphics WinMark 98 tests. It had three free ISA slots and another three PCI slots left over to add in peripherals.

The speakers sounded pretty good, but there was a lot of noise from the soundcard at high volumes, and its MIDI playback was ordinary. The cable that connected the PC to the speakers ended in two unmarked RCA plugs, which meant a bit of trial and error was

required to work out which one was left and which was right. The monitor looked great, but at 15in was a little small for an ultimate system (it was actually the same monitor Datawell supplied for its budget machine).

While this system was down the bottom end of most tests in this category, it blew away almost all of the budget PCs in most tests, and it's a lot closer in price to the budget systems than it is to many of the ultimate PCs. It's also helpful to note that while its score in the Ziff-Davis Business Winstone 98 test was not brilliant compared with others in its category, this PC would have no trouble at all handling your business applications.

Josh Mehlman

■ Distributor	Datawell
■ Phone	(02) 9748 8677
■ Price	\$2,999
■ In short	A good performer for its price.

Dimension XPSR-450

DELL

It's hard to talk about any Dell or Gateway machine without comparing the two directly, so it was with bated breath that we awaited Dell's answer to the Gateway G6-450XL beast. For the most part it was a neck-and-neck race between the two, with Dell just edging out Gateway in the majority of the Ziff-Davis benchmarking tests. The Dell did not have the profusion of features that mark the Gateway, but then it also came in at a cheaper price.

In terms of performance, it was a mixed bag of results. The Dell wasn't very good at 3D processing, coming third last with its STB Velocity 128 AGP card. But it was better with the 2D processing in the Ziff-Davis High-End Graphics WinMark



98 and Business Graphics WinMark 98 tests, settling comfortably in the middle of the pack. There was plenty of storage on the 10.1G IBM hard drive, which proved to be a great achiever and gained a third placing in both the High-End Disk Win-

Mark 98 and the Business Disk WinMark 98 tests. The Hitachi DVD-ROM also scored extremely well, coming a highly commendable third in the Ziff-Davis CD-ROM WinMark 98: Overall test. This is more surprising if you look at the results (see page 136), because you'll see that the other five DVD-equipped systems make up the bottom five in the CD-ROM WinMark 98: Overall list.

Dell was also one of only three manufacturers to include a 19in monitor with their system. As with the Gateway, the Dell system had some fantastic speakers. These were the Altec Lansing USB controlled ACS495 omnidirectional satellites and subwoofer. The Turtle Beach Montego A3D soundcard outputted high-quality sound and you'd definitely enjoy listening to audio CDs, DVDs and games on it.

All up, the Dimension XPSR-450 is a great system, lacking only powerful graphics capabilities. It should prove to be more than an equal match for just about anything you care to run on it. (Note: Dell has informed us that the casing will differ from that pictured here).

Darren Ellis

■ Distributor	Dell Computer
■ Phone	1300 303 107
■ Online	http://www.dell.com.au/
■ Price	\$4,899
■ In short	A great all-round system let down slightly in the graphics department.

Gateway G6-450XL

GATEWAY

We first reviewed this system two months ago (see *APC* October, page 40), and were blown away by its features. We liked it so much that it was a nominee for Best Multimedia Product of 1998 in the annual *APC* awards. Now we can see how it fares against other similarly configured machines.

After more than a month of drooling over this machine, we were surprised to see that it wasn't first in any of the Ziff-Davis test suites, instead coming rather close in some and nowhere near the mark in others. The graphics scores were where the G6-450XL fell short. In the Ziff-Davis 3D WinBench tests, the scores were quite good, but what we have seen is that a 3D AGP card/Voodoo2 accelerator combination struggles to come close to beating a single Riva TNT card. In both the High-End Graphics WinMark 98 and the Business Graphics WinMark 98 tests it scored below average. In all the other tests the



machine was within the top five or six, except for CD-ROM WinMark 98: Overall, in which it came last.

As a machine taken on its own merits, this is a sure-fire winner. It had a hard drive that was 4.3G bigger than its nearest rival, by far the best sound of any of the machines we tested, and it was made for playing huge, graphics-intensive 3D games. Note, however, that if the program accesses the CD a lot you'll encounter jumping and jerkiness. This machine doesn't have the benchmarking performance of some of the other systems in this review and it comes in at a hefty \$6,045, but Gateway has assured us that much better is on the way in terms of performance.

Darren Ellis

■ Distributor	Gateway
■ Phone	1800 500 734
■ Online	http://www.gw2k.com.au/
■ Price	\$6,045
■ In short	Expensive, but we still like it.

Vizon

OPTIMA COMPUTER TECHNOLOGY

Australian manufacturer Optima turned out quite an impressive system with the Vizon. Its 450MHz Pentium II was accompanied by 64M of RAM; a little lean considering the price of the system. The 9.1G Seagate Medalist Pro hard disk drive was also impressive, but again, could have been bigger. The 17in monitor had reasonable image quality, although nothing spectacular, and the PC had a Diamond Viper V550 display card, which was nothing short of brilliant. Another bonus was the trayless DVD-ROM and Cinemaster DVD playback card.

This PC scored well in the Ziff-Davis graphics tests, as did all the PCs equipped with Diamond Viper V550 cards. Its Ziff-Davis Disk WinMark scores were also both above average. Its CPUMark32 score was at the lower end of the 450MHz Pentium II scale, but still well ahead of any other processor. The DVD-ROM was rather slow

in the CD-ROM WinMark 98 test, but DVD drives are usually slow when compared with dedicated CD-ROM drives. Business Winstone 98 rated this PC bang in the middle of the field.

For an ultimate system, the Vizon had a couple of not-very-ultimate features, namely the soundcard and speakers. The sound reproduction of the card was less than impressive and its MIDI playback was very ordinary. The speaker and subwoofer combination looked very interesting and had impressive volume and bass response, but the higher end was decidedly dull. Some soundcards have graphics equaliser controls to compensate for this, but the Crystal soundcard's drivers didn't include one.



Judging by the bundled software, which included Microsoft Home Essentials and IBM AntiVirus, this was intended to be a home system. The presence of a subwoofer kept it out of contention for an office system; it's hard to imagine a workplace where a subwoofer would be necessary or welcome. The graphics and DVD playback were great for a home PC, but the sound still needed a little work.

Josh Mehlman

■ Distributor	Optima Computer Technology
■ Phone	(02) 9475 2777
■ Online	http://www.optima.com.au/
■ Price	\$4,995
■ In short	Quite impressive; a good high-end home system.

98 Professional PII-450

PIONEER

Although it seemed a little underdressed among the parade of chic-looking machines, the Pioneer 98 Professional suffered no intimidation when it came to performance. In benchmarking tests it performed consistently well, topping, among others, the Ziff-Davis Business Winstone 98 and 3D WinBench tests.

The Pioneer's 3D WinBench score was as much a victory for the Pioneer Pro as it was for the 16M Diamond Viper V550. All



of the top five scorers in the 3D WinBench test used this formidable card, but this is not to demean the Pioneer Pro, which managed to keep an 8% performance lead on its nearest rival.

When judging the Business Winstone 98 scores it's probably best to keep in mind that none of the high-end machines tested would break a sweat when dealing with business applications. Without diminishing the Pioneer Pro's victory, judging any machine's business performance on this basis alone seems fairly futile.

The rest of the Ziff-Davis tests revealed no notable weaknesses — the hard disk and CPU scores were well above average. Pioneer made a concerted effort to keep the cost of this performance as low as possible by avoiding any compromise on the core elements of the package and economising on what some might consider the more indulgent features of high-end systems. The Pentium II 450MHz, 17in DiamondView monitor, 64M of PC100 SDRAM and an IBM 10G hard disk were hard to criticise. However, the 10W speaker and 20W subwoofer combination of the PS Multimedia speakers lacked the oomph to compensate for the somewhat mediocre choice of an AWE64 soundcard.

There's very little this machine won't do, and at the price it would be very tempting for anyone looking for a multipurpose PC that won't fall short in business or leisure applications.

Andrew Colley

- **Distributor** Pioneer Computers
- **Phone** (02) 9690 2888
- **Online** <http://www.pioneercomputers.com.au/>
- **Price** \$3,999
- **In short** Marvellous performance at a good price.

TPG Ultra Office

TOTAL PERIPHERALS GROUP

Clearly 'Ultra Office' is a misnomer — unless your job involves playing a serious amount of games. This machine is an excellent gaming system, with some of the

best video and audio hardware you can get, along with a large hard disk, plenty of memory and a large monitor. There would be little need for this kind of hardware in an office environment.

The processor supplied for this system was a 450MHz Pentium II, with 128M of RAM. The video and audio subsystems consisted of a Diamond Viper V550 and Diamond's Monster Sound MX200 — both top-class performers. The 3D video performance of the Ultra Office was beaten only by



the Pioneer 98 Professional system. Its 2D performance was also up there with the best.

It was a little disappointing that the system did not come with a DVD drive, although the performance of its 36x CD-ROM drive was the best of the bunch. The 19in monitor was top quality, and was one of only three 19in monitors supplied.

An 8.6G hard disk was installed in the system, as was an LS-120 drive — also one of the few systems to include this feature. A 56K modem was also packaged with the Ultra Office, installed internally in the chunky tower case. A good set of Yamaha speakers was also supplied (*sans* subwoofer).

The overall system performance of the TPG was about average. It scored 28.97 in Ziff-Davis' Business Winstone 98 benchmark. Its relative disk performance was poor in both benchmarks, falling in the bottom half for both Business and High-End Disk WinMark tests.

Like the TPG Office, the Ultra Office comes with a three-year onsite warranty as standard, making it a great choice for neophyte buyers conscious of having a good warranty. Only two other vendors could match this offer. With this, and the quality of its components in mind, the TPG's price tag of \$5,495 is not in any way unreasonable.

Nathan Taylor

- **Distributor** Total Peripherals Group
- **Phone** (02) 9878 3877
- **Online** <http://www.tpg.com.au/>
- **Price** \$5,495
- **In short** A nice machine, but hardly one for the office.

C1000P

UNITED PACIFIC

For a system with a 3D card, this one scored abysmally in the Ziff-Davis 3D WinBench test, registering results well below those of any other machine — a key indicator that this system is better suited to small business or low-key gamers. The Diamond Fire GL 1000 Pro card, based on the 3DLabs Permedia 2 chip, was once offered for high-end graphics workstations, but it doesn't quite make the grade in our Direct 3D-based 3D WinBench 98 test. In the other Ziff-Davis tests, the C1000P's performance was average, neither excelling nor failing at any one thing.

The machine came with an IntelliMouse and a Microsoft Natural keyboard, which is something you either love or hate. We quite liked the Samsung SyncMaster 700s monitor — it came with mounted speakers which was the only



sound option. Luckily, they angle slightly outwards so that if you're positioned in front of the monitor you get crisp stereo sound. This was another system to feature the Creative Labs AWE64 soundcard.

The C1000P came with one of the smaller hard drives in this review — a Quantum Viking 4.5G. This may seem a bit small for an ultimate machine, but United Pacific included a Zip 100 drive. A bonus was that there were three PCI slots, two ISA and one shared PCI/ISA slot, giving every opportunity to upgrade.

Compared with the other 400MHz Pentium II-based systems, the price of the C1000P seems a little steep. However, if you're new to PCs, you'd probably want to take advantage of the fact that the price includes free installation — something none of the other vendors in this review offer.

Darren Ellis

- **Distributor** United Pacific
- **Phone** (02) 9526 222
- **Online** <http://www.unitedpacific.com.au/>
- **Price** \$4,775
- **In short** A little pricey for the specs and performance.

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Results: Business Winstone 98

	0	50
Pioneer 98 Professional PII-450		32.9
Alpha Computer Alpha PII-450		31.4
Dell Dimension XPSR-450		30.7
Beyond SuperO P2 Speedo		30.1
Adelong Advantage Multimedia MP450		29.9
Gateway G6-450XL		29.8
Optima Vizon		29.7
Compucon Hyperion 2450		29.3
TPG Ultra Office		29
United Pacific C1000P		28.7
Also Technology Vogue Performer II 400MHz		27.4
Datawell Expert Performance II		27.1
Compaq Presario 5179		24

Results: 3D WinBench

	0	2,000
Pioneer 98 Professional PII-450		1,830
TPG Ultra Office		1,700
Optima Vizon		1,680
Adelong Advantage Multimedia MP450		1,640
Gateway G6-450XL		1,310
Alpha Computer Alpha PII-450		1,250
Beyond SuperO P2 Speedo		1,120
Compucon Hyperion 2450		1,080
Also Technology Vogue Performer II 400MHz		1,040
Datawell Expert Performance II		914
Dell Dimension XPSR-450		851
Compaq Presario 5179		815
United Pacific C1000P		559

Results: Business Graphics WinMark 98

	0	250
Pioneer 98 Professional PII-450		238.7
Alpha Computer Alpha PII-450		225.7
Beyond SuperO P2 Speedo		224
Optima Vizon		220
TPG Ultra Office		218
Compucon Hyperion 2450		216
Adelong Advantage Multimedia MP450		212
Dell Dimension XPSR-450		196.3
Gateway G6-450XL		195.7
Also Technology Vogue Performer II 400MHz		193.3
United Pacific C1000P		187.3
Datawell Expert Performance II		178.3
Compaq Presario 5179		155.3

Results: High-End Graphics WinMark 98

	0	350
Pioneer 98 Professional PII-450		304
Alpha Computer Alpha PII-450		299.3
Beyond SuperO P2 Speedo		298.3
Compucon Hyperion 2450		288.3
TPG Ultra Office		284
Optima Vizon		277.7
Adelong Advantage Multimedia MP450		272.7
Also Technology Vogue Performer II 400MHz		257
Dell Dimension XPSR-450		250.7
United Pacific C1000P		246.7
Gateway G6-450XL		233.7
Datawell Expert Performance II		219
Compaq Presario 5179		187.7

Results: CD-ROM WinMark 98: Overall

	0	2,000
TPG Ultra Office		1,836.7
Beyond SuperO P2 Speedo		1,790
Dell Dimension XPSR-450		1,743.3
Adelong Advantage Multimedia MP450		1,673.3
Pioneer 98 Professional PII-450		1,666.7
Datawell Expert Performance II		1,533.3
Also Technology Vogue Performer II 400MHz		1,530
United Pacific C1000P		1,510
Alpha Computer Alpha PII-450		1,390
Optima Vizon		1,290
Compaq Presario 5179		1,266.7
Compucon Hyperion 2450		1,060
Gateway G6-450XL		891

Results: CPUmark32

	0	1,500
Pioneer 98 Professional PII-450		1,223.3
Alpha Computer Alpha PII-450		1,160
Beyond SuperO P2 Speedo		1,150
TPG Ultra Office		1,123.3
Compucon Hyperion 2450		1,120
Optima Vizon		1,120
Dell Dimension XPSR-450		1,110
Gateway G6-450XL		1,106.7
Adelong Advantage Multimedia MP450		1,090
United Pacific C1000P		1,063.3
Datawell Expert Performance II		1,040
Also Technology Vogue Performer II 400MHz		994.7
Compaq Presario 5179		863

Results: High-End Disk WinMark 98

	0	5,500
Pioneer 98 Professional PII-450		5,413.3
Alpha Computer Alpha PII-450		5,276.7
Dell Dimension XPSR-450		5,216.7
Gateway G6-450XL		5,103.3
Optima Vizon		4,856.7
Adelong Advantage Multimedia MP450		4,786.7
United Pacific C1000P		4,750.0
Beyond SuperO P2 Speedo		4,503.3
Also Technology Vogue Performer II 400MHz		4,356.7
Compucon Hyperion 2450		4,343.3
Datawell Expert Performance II		3,943.3
TPG Ultra Office		3,733.3
Compaq Presario 5179		3,403.3

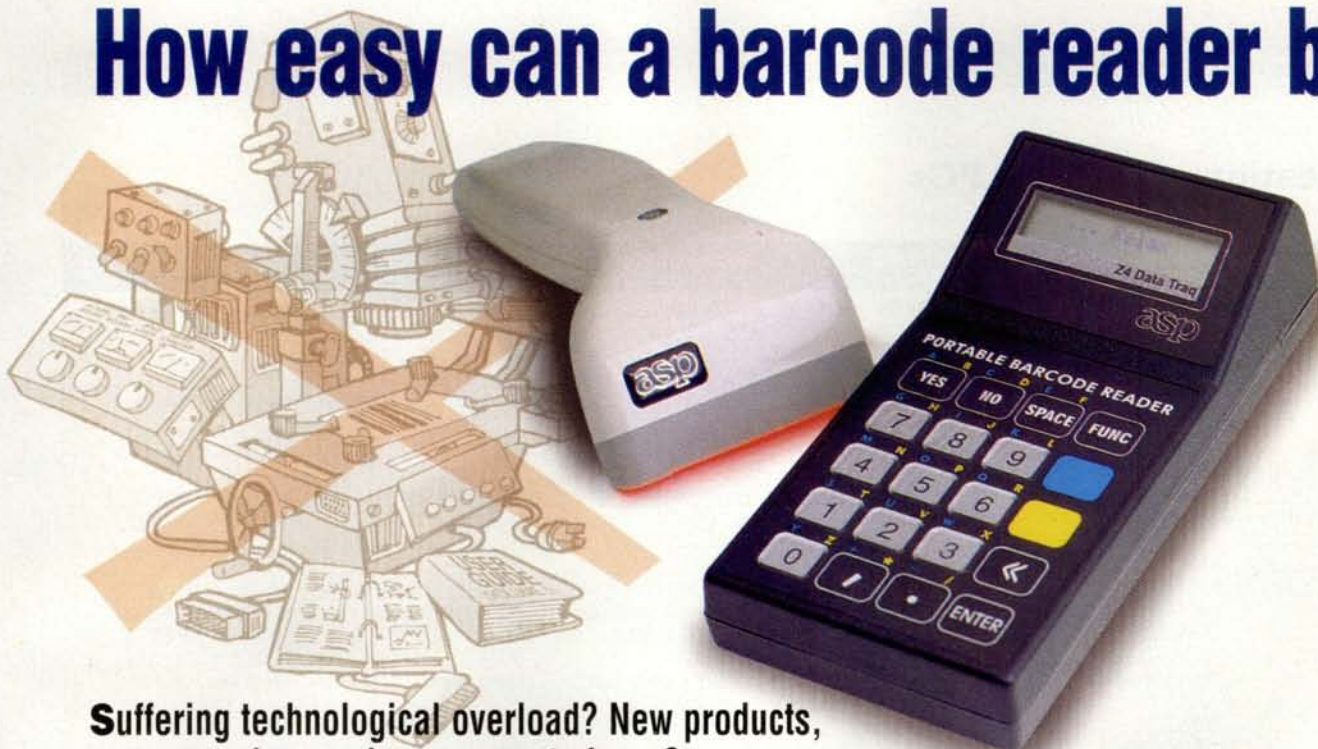
Results: Business Disk WinMark 98

	0	2,000
Pioneer 98 Professional PII-450		1,923.3
Alpha Computer Alpha PII-450		1,896.7
Dell Dimension XPSR-450		1,880.0
Gateway G6-450XL		1,830.0
United Pacific C1000P		1,676.7
Optima Vizon		1,663.3
Adelong Advantage Multimedia MP450		1,643.3
Beyond SuperO P2 Speedo		1,533.3
Also Technology Vogue Performer II 400MHz		1,500.0
Compucon Hyperion 2450		1,486.7
Datawell Expert Performance II		1,293.3
TPG Ultra Office		1,266.7
Compaq Presario 5179		1,166.7

The use of the Intel BusMastering hard disk driver on systems using Ultra-DMA hard drives may report incorrectly high scores in the Ziff-Davis WinBench Business Disk WinMark 98 and High-End Disk WinMark 98 tests. Some of the systems in this review may report such results.

The use of the Intel BusMastering hard disk driver on systems using Ultra-DMA hard drives may report incorrectly high scores in the Ziff-Davis WinBench Business Disk WinMark 98 and High-End Disk WinMark 98 tests. Some of the systems in this review may report such results.

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Specifications: Ultimate PCs

Product	Advantage Multimedia MP450	Alpha PII-450	Vogue Performer II 400MHz	Beyond Super0 P2 Speedo	Presario 5179
Distributor	Adelong Computers	Alpha Computer	Also Technology	Beyond Computers	Compaq Computer Australia
Phone	1800 626 345	(03) 9415 9177	(02) 9519 4600	(02) 9417 3688 or (03) 9646 4388	1300 368 369
Fax	(02) 9669 3216	(03) 9415 9188	(02) 9550 6583	(02) 9417 3699	(02) 9911 1800
Online	http://www.adelong.com.au/	http://www.alphacomputer.com.au/	http://www.alsotech.com.au/	http://www.beyondcomputers.com.au/	http://www.compaq.com.au/
Price	\$3 590	\$4 590	\$3,385	\$3,980	\$4,099
Specifications					
Processor	Intel Pentium II 450MHz	Intel Pentium II 450MHz	Intel Pentium II 400MHz	Intel Pentium II 450MHz	Intel Pentium II 350MHz
Tested/maximum RAM (M) and type	64/512/SDRAM (PC100)	64/1024/SDRAM (PC100)	64/768/SDRAM (PC100)	64/1024/SDRAM (PC100)	64/384/SDRAM (PC100)
Secondary cache (K)	512	512	512	512	512
Hard disk	6.5G Seagate ST36530A	10.1G IBM	5.1G Quantum Fireball EL5.1A	5.1G Quantum Fireball EL5.1A	6.0G Seagate Medalist
Hard disk controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller
Hard disk file system	FAT32	FAT32	FAT32	FAT32	FAT32
Graphics card	Diamond Viper V550	Matrox Millennium G200/ Diamond Monster 3D II	Matrox Millennium G200	Matrox Millennium G200	ATI 3D Rage LT Pro
Video bus type	AGP	AGP	AGP	AGP	AGP
Video RAM	16M SDRAM	8M/12M	8M	8M	4M
Video controller chip	nVidia Riva TNT	MGA-200/ 3Dfx Voodoo2	MGA-200	MGA-200	ATI
Graphics driver name and version	vprdrvle.drv (4.10.01.220)	mgapdx64.drv (4.10.01.4110)	mgapdx64.drv (4.10.01.4100)	mgapdx64.drv (4.10.01.4100)	maxcw4.drv (4.10.01.2411)
Monitor	17in Mitsubishi Plus 71	17in Philips	17in Diamond View	17in Sony Trinitron CPD-200ES	15in Compaq
Tested resolution/colour depth/refresh rate	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz
CD/DVD-ROM drive	32x Matshita CR-588	Pioneer DVD-ROM DVD-A02	32x Mitsubishi	32x LG CD-ROM CRD-8322B	Compaq DVD-ROM GD-2500
Soundcard	Xitel Storm VX	Sound Blaster PCI 128	Creative Labs AWE64	Creative Labs SoundBlaster PCI128	ESS Audio PCI
Modem	56K internal	56K V.90 internal	56K internal	No	56K ITU V.90 internal
OS available	Windows 98	Windows 98	Windows 98	Windows 98	Windows 98
Warranty	3 years RTB parts and labour, Australia wide	RTB, 2 years parts, 5 years labour	2 years RTB parts, 5 years labour	RTB 2 years parts, 5 years labour	1 year onsite, parts and labour
Bundled software and accessories	Vet AntiVirus, Altec Lansing ACS45 speakers (subwoofer and satellites)	Cinemaster DVD Playback card, Lotus SmartSuite 97, Encarta Encyclopedia, Norton AntiVirus, PC Alert, Nicole multimedia speakers	PCI 10/100M Ethernet card, LS-120 drive, 3D G720 multimedia speakers	JUSTer speakers (subwoofer and satellites)	MS Encarta, Incoming, ColorDesk Photo, Intel Video Phone 3.8, MS Works 4.5, Quicken 7.0 and VideoLink mail, monitor mounted speakers
3D Disclosure Information					
DirectX version	6	6	6	6	6
Flat shading/Gouraud shading	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Dithering/Z-Buffer	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Perspective correction	Capable	Capable	Capable	Capable	Capable
Nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Nearest mipmap nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Linear mipmap nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Modulate/Decal texture blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
DecalAlpha/ModulateAlpha texture blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Not capable
Flatwrap texture addressing	Capable	Capable	Capable	Capable	Capable
Cylindrical wrap u/Wrap v	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Clamp/Mirror texture addressing	Capable/Capable	Capable/Capable	Capable/Not capable	Capable/Not capable	Capable/Not capable
Cull counterclockwise/Cull clockwise	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Cull none	Capable	Capable	Capable	Capable	Capable
Fog vertex linear/Fog table linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Not capable
Fog table exponential/Specular highlights	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Not capable/Capable
Colour key/Alpha transparency	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Source alpha/Add pixel blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Modulate pixel blending/Alpha vertices	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Fog vertex and colour key	Capable	Capable	Capable	Capable	Capable
Fog vertex and alpha	Capable	Capable	Capable	Capable	Capable
Anti-aliasing/Texture swapping	Incorrect/Capable	Capable/Capable	Incorrect/Capable	Incorrect/Capable	Not capable/Capable
Narrow z/Wide z accuracy	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect
High triangle count/Texture fidelity	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable

1. 'Incorrect' means that while a card's drivers claimed to support a certain feature, under our testing conditions the card was found to perform this feature incorrectly.

2. All products used in these tests are shipping versions available to the public at the time of publication, unless otherwise stated.

3. Winstone, WinBench and associated programs are registered trademarks of the Ziff-Davis Publishing Company.

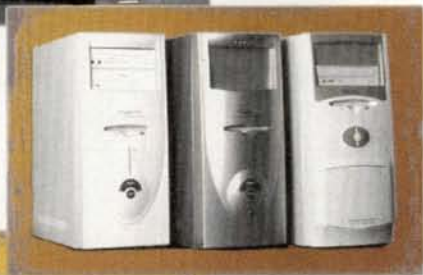
4. These tests were performed without independent verification by Ziff-Davis, and Ziff-Davis makes no representations or warranties as to the results of the tests.

5. The Vogue Challenger, ClipperPro, Expert Entertainer and KTX systems could not run tests at 1,024 by 768 by 256K colours. A resolution of 1,024 by 768 by 64K colours was used instead.

6. The above specifications refer to the actual machines tested by APC Labs. Check with the vendors for the latest components.

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\$178 - Super Music Centre Wooden Woofer system

\$99 - 56K V90 Fax/Modem and many more.

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(Intel Celeron 300MHz CPU)

P2333 system \$1799
(Intel PII 333MHz CPU)

P2350 system \$1899
(Intel PII 350MHz CPU)



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NSW: 02 9417 3688; VIC: 03 9646 4388 or
Visit www.bcntech.com for on line Quotation
(Resellers are welcome, limit of one for each area)

Specifications: Ultimate PCs

Product	Compucon Hyperion 2450	Expert Performance II	Dell Dimension XPSR-450	G6-450XL
Distributor	Compucon Computers	Datawell	Dell	Gateway
Phone	(02) 9417 7166	(02) 9748 8688	1300 303 107	1800 500 734
Fax	(02) 9417 7329	(02) 9748 8677		
Online	http://www.compucon.com/		http://www.dell.com.au/	http://www.g2k.com.au/
Price	\$5,899	\$2,999	\$4,899	\$6,045
Specifications				
Processor	Intel Pentium II 450MHz	Intel Pentium II 400MHz	Intel Pentium II 450MHz	Intel Pentium II 450MHz
Tested/maximum RAM (M) and type	64/768/SDRAM (PC100)	64/384/SDRAM (PC100)	128/768/SDRAM (PC100)	128/768/SDRAM (PC100)
Secondary cache (K)	512	512	512	512
Hard disk	8.4G IBM-DTTA-350840	4.3G Fujitsu	10.1G IBM-DTTA-371010	14.4G IBM Ultra ATA
Hard disk controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller
Hard disk file system	FAT32	FAT32	FAT32	FAT32
Graphics card	Matrox Millennium G200	Intel i740 -980501-	STB Velocity 128	ATI 3D Rage Pro/STB Blackmagic 3D
Video bus type	AGP	AGP	AGP	AGP
Video RAM	8M	8M SDRAM	8M	8M SDRAM/12M
Video controller chip	MGA-200	i740	nVidia Riva 128ZX	ATI Rage Pro/3Dfx Voodoo2
Graphics driver name and version	mgapdx64.drv (4.10.01.4100)	gfxdrv.drv (4.10.01.1701)	stbv128.drv (4.10.01.9180)	macxw4.drv (4.10.01.2278)
Monitor	17in Compucon 778A	15in Videocom	19in Dell D1226H	19in VX 900
Tested resolution/colour depth/refresh rate	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz
CD/DVD-ROM drive	Creative DVD-ROM DVD2240E	32x Diamond Data	Toshiba DVD-ROM SD-M1202	Toshiba DVD-ROM SD-M1102
Soundcard	Creative Labs Sound Blaster PCI64	S3 SonicVibes PCI Audio Device	Turtle Beach Montego A3D	Creative Labs PCI 64
Modem	No	No	No	56K internal TelePath
OS available	Windows 95/98/NT	Windows 98	Windows 98	Windows 98
Warranty	3 years onsite parts and labour Australia wide	2 years onsite parts and labour	3 years RTB parts and labour	3 years RTB parts and labour
Bundled software and accessories	LS-120 drive, Monitor speakers and RockExcel subwoofer, MS Home Collection	Lotus SmartSuite 97 CD, JHL160 multimedia speakers	Altec Lansing ACS495 speakers (subwoofer and satellites)	LS-120 drive, CD-RW drive, Boston Acoustic speakers (subwoofer and satellites), MS Office SBE
3D Disclosure Information				
DirectX version	6	6	6	6
Flat shading/Gouraud shading	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Dithering/Z-Buffer	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Perspective correction	Capable	Capable	Capable	Capable
Nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Nearest mipmap nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Linear mipmap nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Modulate/Decal texture blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
DecalAlpha/ModulateAlpha texture blending	Capable/Capable	Capable/Capable	Not capable/Capable	Capable/Capable
Flatwrap texture addressing	Capable	Capable	Capable	Capable
Cylindrical wrap u/Wrap v	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Clamp/Mirror texture addressing	Capable/Not capable	Capable/Capable	Capable/Capable	Capable/Capable
Cull counterclockwise/Cull clockwise	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Cull none	Capable	Capable	Capable	Capable
Fog vertex linear/Fog table linear	Capable/Capable	Capable/Not capable	Capable/Capable	Capable/Not capable
Fog table exponential/Specular highlights	Capable/Capable	Not capable/Capable	Capable/Capable	Not capable/Capable
Colour key/Alpha transparency	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Source alpha/Add pixel blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Modulate pixel blending/Alpha vertices	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Fog vertex and colour key	Capable	Capable	Capable	Capable
Fog vertex and alpha	Capable	Capable	Capable	Capable
Anti-aliasing/Texture swapping	Incorrect/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Narrow z/Wide z accuracy	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect
High triangle count/Texture fidelity	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable

1. 'Incorrect' means that while a card's drivers claimed to support a certain feature, under our testing conditions the card was found to perform this feature incorrectly.

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6. The above specifications refer to the actual machines tested by APC Labs. Check with the vendors for the latest components.

Specifications: Ultimate PCs

Product	Vizon	Pioneer 98 Professional PII-450	TPG Ultra Office	C1000P
Distributor	Optima Computer Technology	Pioneer Computers	Total Peripherals Group	United Pacific
Phone	(02) 9475 2777	(02) 9690 2888	(02) 9850 0800	(02) 9526 2222
Fax	(02) 9475 2701	(02) 9690 0333	(02) 9878 3877	(02) 9526 2417
Online	http://www.optima.com.au/	http://www.pioneercomputers.com.au/	http://www.tpg.com.au/	http://www.unitedpacific.com.au/
Price	\$4,995	\$3,999	\$5,495	\$4,775
Specifications				
Processor	Intel Pentium II 450MHz	Intel Pentium II 450MHz	Intel Pentium II 450MHz	Intel Pentium II 400MHz
Tested/maximum RAM (M) and type	64/384/SDRAM (PC100)	64/768/SDRAM (PC100)	128/1024/SDRAM (PC100)	128/1024/SDRAM (PC100)
Secondary cache (K)	512	512	512	512
Hard disk	9.1G Seagate Medalist Pro	10G IBM DTTA 37100	8.6G Seagate ST38641A	4.5G Quantum Viking II
Hard disk controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller	Intel 82371AB/EB PCI Bus Master IDE Controller
Hard disk file system	FAT32	FAT32	FAT16	FAT32
Graphics card	Diamond Viper V550	Diamond Viper V550	Diamond Viper V550	Diamond FireGL 1000 Pro
Video bus type	AGP	AGP	AGP	AGP
Video RAM	16M SDRAM	16M SDRAM	16M SDRAM	8M SGRAM
Video controller chip	nVidia Riva TNT	nVidia Riva TNT	nVidia Riva TNT	3DLabs Permedia 2
Graphics driver name and version	vprdrvle.drv (4.10.01.220)	vprdrvle.drv (4.10.01.220)	vprdrvle.drv (4.10.01.220)	glint.drv (4.10.01.2357)
Monitor	17in Optima	17in Mitsubishi Diamond 1772e	19in CTX VL950	17in Samsung Syncmaster 700s
Tested resolution/colour depth/refresh rate	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz	1,024 by 768/256/60Hz
CD/DVD-ROM drive	Pioneer DVD-ROM DVD-A02	32x max Matsushita CD-ROM CR-588	36x max Diamond Data	32x max Diamond Data
Soundcard	Crystal PCI	Creative AWE64 16-bit Audio	Diamond Monster Sound	Creative Sound Blaster Awe 64
Modem	56K internal	56K internal	No	No
OS available	Windows 98	Windows 98	Windows 98 / Windows NT	Windows 95/98/NT
Warranty	3 years RTB parts and labour	2 years RTB parts and 5 years labour	3 years onsite parts and labour	2 years onsite parts and labour
Bundled software and accessories	Zip 100 drive, MS Home Essentials 98, IBM AntiVirus, Optima speakers (subwoofer and omni-directional satellites)	PS SW102 speakers (subwoofer and satellites)	LS-120 drive, Dual Boot system with Windows 98/NT, Outlaws and Incoming 3D games, Yamaha YST-M15 multimedia speakers	No bundled software but a range available for 20% off. Price includes installation. Monitor-mounted speakers.
3D Disclosure Information				
DirectX version	6	6	6	6
Flat shading/Gouraud shading	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Dithering/Z-Buffer	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Perspective correction	Capable	Capable	Capable	Capable
Nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Nearest mipmap nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Linear mipmap nearest/Linear	Capable/Capable	Capable/Capable	Capable/Capable	Incorrect/Incorrect
Modulate/Decal texture blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
DecalAlpha/ModulateAlpha texture blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Flatwrap texture addressing	Capable	Capable	Capable	Capable
Cylindrical wrap u/Wrap v	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Clamp/Mirror texture addressing	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Cull counterclockwise/Cull clockwise	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Cull none	Capable	Capable	Capable	Capable
Fog vertex linear/Fog table linear	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Not capable
Fog table exponential/Specular highlights	Capable/Capable	Capable/Capable	Capable/Capable	Not capable/Capable
Colour key/Alpha transparency	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Source alpha/Add pixel blending	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable
Modulate pixel blending/Alpha vertices	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Not capable
Fog vertex and colour key	Capable	Capable	Capable	Capable
Fog vertex and alpha	Capable	Capable	Capable	Capable
Anti-aliasing/Texture swapping	Incorrect/Capable	Incorrect/Capable	Incorrect/Capable	Incorrect/Capable
Narrow z/Wide z accuracy	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect	Incorrect/Incorrect
High triangle count/Texture fidelity	Capable/Capable	Capable/Capable	Capable/Capable	Capable/Capable

1. 'Incorrect' means that while a card's drivers claimed to support a certain feature, under our testing conditions the card was found to perform this feature incorrectly.

2. All products used in these tests are shipping versions available to the public at the time of publication, unless otherwise stated.

3. Winstone, WinBench and associated programs are registered trademarks of the Ziff-Davis Publishing Company.

4. These tests were performed without independent verification by Ziff-Davis, and Ziff-Davis makes no representations or warranties as to the results of the tests.

5. The Vogue Challenger, ClipperPro, Expert Entertainer and KTX systems could not run tests at 1,024 by 768 by 256K colours. A resolution of 1,024 by 768 by 64K colours was used instead.

6. The above specifications refer to the actual machines tested by APC Labs. Check with the vendors for the latest components.

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Workshop

143 APC Magazine

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Welcome to Workshop, the section dedicated to bringing you all manner of tips, interesting information and do-it-yourself tutorials. Within these pages you will find useful shareware, informative operating-system-specific columns and easy-to-follow programming tutorials.

The *Linux Pocketbook* is on sale now, and provides all the information and software you need to get started with this open source operating system. The cover CD-ROM features the latest version of the popular Red Hat Linux distribution, so you'll be ready to go. And if you are about to upgrade to Windows 98, the *Windows 98 Pocketbook* is still in the shops. Now you've got no excuse for putting off those upgrades, and the Pocketbooks series tells you how!

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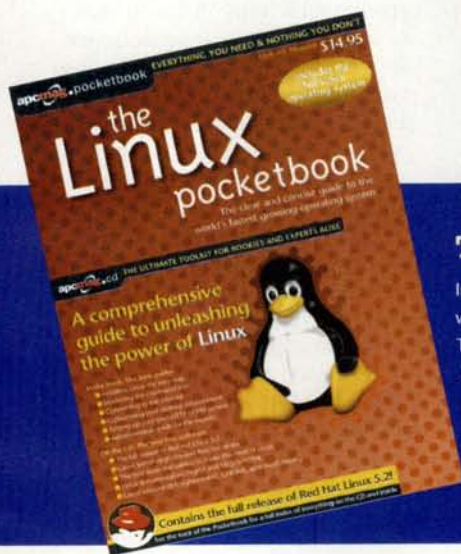
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All the files mentioned here can be found in the Workshop section of this month's **apcmag.cd**.

The Linux Pocketbook

Interested in Linux? Make the most of your PC and find out why Linux is the world's fastest growing operating system. The *Linux Pocketbook* has everything you need to get started, including the operating system on the cover CD. **On sale NOW at newsagents everywhere.**

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Win! Win! Win!

Workshop is on the lookout for the most interesting, strange, funny, or downright weird software bugs you can find. These include code snippets, examples of features that function poorly, or procedures for crashing a particular application. Anything and everything that is buggy deserves mention.

Send us the bug of your choice via email to bugs@acp.com.au or snail mail, and you'll be in the running to win your choice of **development or application software** prizes from Workshop's software collection. The prizes change each month to ensure there's always something interesting for avid bug-hunters. Feel free to send screen captures or example code listings, as well as details of how to duplicate the bug, if applicable.

Winners will be announced in the February edition of *APC*, and the winning bug will appear in the Bug of the Month column. So start hunting!



Bug of the Month

Here's the dumbest bug report I have ever seen: a reader made a copy of **COMMAND.COM**, edited the copy in a text editor, then ran the edited file as a program. When I sent him a short note suggesting that this was not a smart thing to do, I got a fairly indignant reply claiming experiments like this were the only way to learn about computers. Maybe his next experiment ought to be 'FORMAT C:'.

In contrast, Allen Browne uncovered a serious bug in Access (Version 2, 95 and 97).

1. Open a form that has many hundreds of records.
2. Delete one of the early records.
3. Use RecordsetClone and Bookmark to move to a record more than 262 records further on.
4. Edit the record and save your changes. At step three, Access shows onscreen the record you sought. The edits at step four are written to the following record. If two records are deleted at step two, the edits are written to two records after the one shown onscreen. Clearly Access is mismatching the form's bookmark.

The potential to lose data is quite significant. Microsoft's patch for Access 97 is at <http://support.microsoft.com/support/kb/articles/Q172/7/33.asp>.

Allen wins his choice from Workshop's software and reference toolbox.

Get involved

All files mentioned in Workshop can be found on **apcmag.cd** or downloaded from our Web site at <http://www.apcmag.com>. Here you will also find a number of online discussion forums where you can discuss technical issues.

Don't forget that Workshop is a reader-input section. Feel free to contact us by sending any ideas, comments or criticisms to workshop@acp.com.au, or send snail mail to APC Workshop, PO Box 37, Sydney NSW 1028.

Ashton Mills and Stephen Withers,
Workshop editors

Part 3 of our graphics card saga: an introduction to 3D graphics. **By Nathan Taylor**

Technobabble

Putting 3D graphics on the screen is not easy. For every frame, you need to undertake some immensely complex calculations just to figure out how the polygons in the 3D scene will appear on the 2D screen. Then there's lighting, texturing, physics modelling, transparency and so on. Trying to do all that just with the CPU is next to impossible.

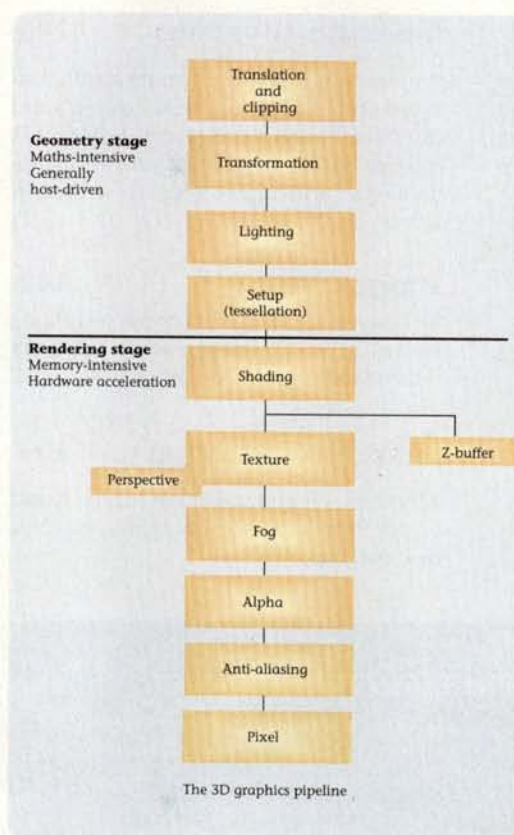
Some fairly basic operations were pulled off in games such as *Ultima Underworld*, *Doom* and *Wolfenstein* (these games were generally referred to as 2.5D, because characters and objects were still represented by sprites, while the walls and environments were 3D).

About three years ago it was becoming apparent that 3D graphics were not going to happen without specialised hardware. The calculations, on top of all the other processing requirements, were just too great. Workstations already had specialised hardware for 3D graphics, but these had not entered the consumer arena because of their cost. Several vendors, like Matrox and S3, had launched graphics accelerators with some 3D functionality, but poor performance meant these accelerators did not become popular. It was 3Dfx, with its Voodoo chipset, which really revolutionised the market. The Voodoo chipset, used on a number of graphics boards from vendors such as Diamond and Orchid, was far faster than anything else on the market at the time, and still holds up well today. The Voodoo was a 3D-only chipset, which meant a 2D card was still needed. Numerous other vendors have released high-performance chips and chipsets since then, including some integrated 2D/3D chipsets, such as nVidia's RIVA and ATI's 3D Rage Pro.

These chips contain circuits specifically designed to deal with the demands of 3D graphics. No truly great 3D applications are really possible without them.

The graphics pipeline

The process of generating a scene in a 3D environment is commonly defined in two



stages: geometry set-up and rendering. The former is usually handled by the CPU (although some hardware does exist to help with this — see under 'Performance' on next page), while the latter is usually the domain of the 3D graphics accelerator.

Geometry setup involves working out which polygons will appear on the screen, and where. Taking into account the position and viewport of the 'camera', the computer must take absolute 3D coordinates of objects within the 3D space and transform them into 2D co-ordinates on the screen. Of course, perspective must be taken into account, so that objects appear smaller the further away they are from the camera, for instance. Objects which are not appearing on the screen must be removed from the calculations (this is called clipping), and objects behind other

objects need to be removed from calculation as well (part of a process called Z-buffering).

Geometry setup is not a trivial task, and it takes the CPU some time to calculate all the variables — the more objects on the screen, the longer it takes. It leaves the PC with a 'wireframe' impression of the scene to be rendered on the screen.

The next step is triangle setup. Sometimes handled by the CPU, sometimes by the graphics accelerator, this involves taking the polygons on the screen and converting them into triangles. Why? Because graphics accelerators are designed to render triangles. All non-curved shapes can be broken down into triangles, and the computer does so for rendering — creating triangle 'meshes'. In new and upcoming games, such as *Quake III Arena*, for example, developers are planning to use curved polygons, which use Bézier values or Non-Uniform Rational Bézier-Splines (NURBS) to describe the curve. Generally, these will have to be converted to triangles as well, although this method does allow for level of detail (LOD) calculations, so

more triangles are rendered as the camera moves closer to the curved object.

Finally, we come to texturing and rendering, which is the task of the graphics accelerator. The graphics card applies textures to the polygons, adjusts for lighting and shadows, and shades the triangles to make them look realistic.

Textures are graphical 'skins' applied to the polygons to make them look more realistic. A blank wall does not look very exciting, but one that has been overlaid with a texture of bricks and graffiti looks almost real. Textures are usually just bitmaps, although occasionally they are animated, transparent, or reflective (for water, mirror, or movie screen effects, for example).

Shading makes triangle edges look less jagged by using colour blending and shadows on polygon ridges. There are numer-

ous types of shading, although flat Gouraud and Phong are the most talked about. The latter is better, although its computational requirements make it unlikely to be used in games, or even some lower-end professional applications, for some time.

And then there's alpha blending, of which the best-known application is fogging. Alpha blending is the art of making an object partially transparent, but still affecting the colour of the object behind it to a greater or lesser degree. Fogging was originally used to reduce the number of polygons in a scene (by hiding distant objects in the fog) in order to lower the computational requirements. It is used for effects in modern games. Believe it or not, there are different types of fog — from linear to exponential, and volumetric to persistent.

Different graphics accelerators support different levels of fog.

Another feature, called anti-aliasing, deals with 'jaggies'. Anybody familiar with computer graphics will know that when you draw a diagonal line on the screen, the square shape of the pixels used in the line makes it look ragged — more like steps than a straight line. It's especially ugly at the edge of a texture map. 3D graphics accelerators overcome this by anti-aliasing — reducing the contrast between the pixels at the edge of a texture map and the colours behind it, to create a smoother edge.

Finally, the graphics accelerator looks after filtering and mip-mapping. Say you were running your screen at 640 by 480. If you moved up to a wall with a 640 by 480 texture so that the wall filled the whole screen, then each pixel in the texture

(called texels) would correspond to a pixel on the screen. But then, if you stepped back, there would be more than one texel per screen pixel, possibly with some overlap between pixels. If you moved forward, then a single texel could occupy a number of pixels. So the graphics card must filter the texture and decide which pixel is what colour. It does this by blending texels inside a single pixel together, and extrapolating the colour. There are various methods by which it can do this, such as (in order of difficulty) bilinear filtering, trilinear and anisotropic filtering. Which filter is used depends on the trade-off between performance and image quality the developer wants to make. Mip-mapping is a technique designed to make filtering faster by storing textures with reduced detail (lower resolution) for attachment to objects that are far away, so that fewer calculations need to be performed on the texture.

The APIs

Like most devices, 3D accelerators have application program interfaces (APIs) which allow developers to create device-independent applications that make use of the features of the hardware. In addition, they can often speed up development by taking care of common tasks for developers.

There's been a lot of discussion lately about which API is the best for games. The main contenders are 3Dfx's Glide, Microsoft's Direct3D and Silicon Graphics (SGI) OpenGL. The best one depends on who you ask, but here's a quick run down of the three.

Glide was developed by 3Dfx for use in developing applications for its own products. It does not licence Glide, so no other graphics cards can make use of the API. Several other graphics card vendors have developed similar APIs for their own cards. Generally, these work very well for the devices they've been designed for, but are hardly hardware-independent.

Direct3D, part of the DirectX family of APIs, is Microsoft's attempt at developing an API for 3D games. It is actually a set of two APIs: immediate mode and retained mode. The immediate mode API provides basic hardware abstraction for the developer, upon which they can build their own 3D engines. This means that Direct3D's immediate mode simply takes care of translating generic 3D commands issued by applications into device-specific 3D commands. It does not provide any advanced features like animation engines or lighting models. Those functions are performed by the Retained Mode API, a 'high-level' API which

has a number of advanced features to allow developers to easily create games using the DirectX engine. Up until Version 6.0, however, this was very poorly implemented, and most developers simply took their own engines and used the Immediate Mode API for hardware translation. It remains to be seen whether the much improved Retained Mode in DirectX 6.0 will lure developers. At this stage, Direct3D does not support geometry processors (unlike OpenGL).

The oldest of the three APIs is OpenGL, which has been in use by SGI for professional 3D applications for a number of years now. OpenGL is a high-level API well liked by developers. The first game to really use OpenGL was id Software's Quake, but since then many games developers have begun using the API for games programming (much to Microsoft's consternation).

Most cards now have some kind of OpenGL driver, although they are divided between those which have an MCD, and those with an ICD. A mini client driver, or MCD, uses some of the default software rendering in the operating system, and does not make full use of the underlying hardware, thus providing a lower performance level than might be provided with full hardware support. An independent client driver, or ICD, has full OpenGL functionality, using all the features of the hardware, and should work even with professional OpenGL applications. Additionally, many vendors released what are called 'mini-ports' of OpenGL, which use only the subset of OpenGL features used by Quake and games based on the Quake engine.

Performance

There are many places in which the 3D graphics pipeline can break down. Sometimes it's the CPU, which can't provide geometry information to the graphics card fast enough. In others, it's the graphics card that cannot render the scene quickly enough.

The rate at which the CPU can deliver polygons obviously depends on its speed — the faster the CPU, the more polygons it can deliver. Some PCs, usually graphics workstations, actually have graphics cards with special geometry processors to take this load off the CPU and deliver guaranteed performance levels. These geometry setup processors are not widely used, however, and are not supported by Direct3D. A vendor's OpenGL driver can take advantage of the geometry processor, therefore many cards with this feature are called OpenGL accelerators.

Graphics card performance is usually measured by the frame rate it achieves on applications. Image quality is another metric that is used, although it is more difficult to quantify. Graphics card vendors will also list the theoretical number of pixels a card can render per second (called the *fill rate*), which limits the maximum frame rate/resolution on the card. The number of triangles a card can handle per second is also quoted quite often. While these latter metrics do provide some indication of the quality of the card, they should not be taken as gospel: on many occasions a card with a lower fill rate and triangle processing speed can outperform a card with more impressive specs. ■

Don't worry about the strange name — Intel's budget processors can be overclocked for performance on the cheap. **By Daniel Rutter**

Step by Step

I last wrote about processor overclocking only seven months ago, but the field's moved on since then.

First, a quick terminology recap. Your CPU's speed is a product of two numbers, the bus speed (also called front-side bus, or FSB), and the multiplier.

The FSB speed is the speed at which the processor talks to the rest of the computer, and is by default 66MHz for almost all processors up to 333MHz, and 100MHz for 350MHz and faster processors. Many motherboards support other FSB speeds — 75, 83, 112 and 133MHz, for example — but non-standard bus FSB speeds usually entail non-standard PCI bus speeds, since the PCI bus speed is set as a fraction of the FSB speed and is only likely to be the correct 33MHz when you're using an 'official' FSB speed. Old motherboards set PCI speed as half of FSB, which makes FSB speeds above 75MHz very tricky. Clock your PCI devices too fast and they may work. Or they may not.

The multiplier is the ratio between the processor's speed of operation and the FSB speed. A 66MHz FSB and a 4.5x multiplier gives you a 300MHz processor. So does a 100MHz FSB and a 3x multiplier, but the faster FSB in the latter will make the computer perform better. If your motherboard supports it, switching to 100MHz FSB and an appropriate multiplier to get much the same processor speed can give a worthwhile speed increase with zero risk, because the processor doesn't care what its FSB speed is as long as the multiplier doesn't push it too far.

The big question is, how far is too far these days? Well, for most processors, one or two steps up the ladder from their rated speed is all you can reasonably expect without spending up big on a Peltier effect heat sink to keep temperatures down, and even then you might not get much more improvement. Old Pentium processors are still as overclockable as they ever were; Pentium IIs can, with good cooling, be pushed quite hard, and the AMD-K6-2 follows in the footsteps of the earlier K6 by being less overclockable than the Intel competition, but cheaper. However, none of this matters, because if you're planning to build a screaming system on the cheap, the current leaders in the overclocking race are the two flavours of Intel Celeron, with daylight third.

Viva Celeron!

The Celeron was designed as a low-cost entry-level chip to compete with bargain-priced AMD and Cyrix/IBM CPUs. In its original spec, the Celeron was and is a Pentium II with no level 2 (L2) cache memory. The Pentium II's large Slot 1 cartridge design accommodates on-board L2 cache. This go-faster memory lives on the motherboard for Socket 7 (Pentium compatible) and Socket 8 (Pentium Pro) chips, and runs at FSB speed. On the Pentium II, the L2 cache runs not at FSB speed, but at half the processor speed, giving a significant performance improvement.

Lack of L2 cache is not a huge disadvantage. For applications like 3D gaming, a 300MHz Celeron performs roughly like a 266MHz Pentium II, but costs little more than half as much. For business applications, it's more like a 233MHz Pentium (not a Pentium II), but that's fast enough for almost all users.

The nice thing about these original Celerons, which come in 266MHz and 300MHz variants, is that their 'Covington' processor core is based on the second generation Pentium II 'Deschutes' core, which means they work fine at faster than 350MHz in almost all cases. And it's not very hard to get them running that fast, though we'll get to that shortly.

The new flavour of Celeron has L2 cache. On the downside, there's only 128K of it, versus the 512K on the full Pentium II. But the new Celeron's cache is built right into the new 'Mendocino' processor core, and runs at full processor speed, making these new chips as fast as an equivalently clocked Pentium II for pretty much all tasks.

The new Celerons are the 300A and the 333. They're more expensive than the older Celerons, but still much cheaper than full Pentium IIs. And they're just as overclockable as their elder siblings; their on-chip cache handles overclocking much better than the Pentium II's arrangement.

Winding up the Celeron

This is where we get to the interesting bit. As designed, all models of Celeron are meant to be locked to their officially specified clock speed. They have a locked multiplier (4x for the 266, 4.5x for the 300 and 300A, 5x for

the 333), which means you'll get that multiplier no matter what you set on your motherboard. And they put a voltage on one pin on the processor connector (CPU contact B21), which is Intel's way of telling motherboards to run that processor at 66MHz FSB, no faster. If pin B21 isn't connected, the processor runs at 100MHz FSB.

If you've got a motherboard that's compliant with Intel's spec, the only way to make a Celeron run at 100MHz FSB is to somehow prevent B21 from making contact, which can be done with a dot of nail polish or a strip of Teflon tape. Fortunately, there are plenty of motherboards that completely ignore Intel's specification and let you set any Slot 1 processor to any FSB speed you like. If you're buying a Celeron with the intention of overclocking it and don't already have a Slot 1 motherboard, going for one of these boards (like the Asus P2B or Abit BX6, for example) is the only sane choice.

Socket 7 overclockers commonly slightly increase the processor core voltage to try to get borderline processors to run at higher speeds. This increases processor temperature and so requires more effective heat reduction strategies, but it works. Overclocked Slot 1 processors can be made more reliable by the same strategy, but they set their core voltage automatically on most motherboards. Changing the voltage on such boards is a pin-covering procedure not unlike the pin B21 hack, but four times worse. Fortunately, there are motherboards that let you set core voltage manually, too; the Abit BX6 does, and is therefore an overclockers' favourite. Mind you, winding up processor voltage too far can and does kill CPUs; if a couple of tenths of a volt doesn't help, you'll do better to try a slower clock speed.

It's possible that an overclocked Celeron will work just fine with the stock heat sink, which is actually pretty good. Many do, particularly in chilly climes. In Australia, however, it's not a bad idea to consider some extra cooling for your Celeron. Overheating probably won't significantly reduce the chip's lifespan, but it will cause crashes; if your overclocked computer works fine for 15 minutes or so and then starts to crash and hang all over the place, an overheating processor is the likely culprit. Larger heat sinks with one or two fans cost around the \$30 mark.

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Processor	Processor type	Price (street, Oct 1 1998)	Performance at rated speed		Probable overclockability	Performance overclocked	
			3D Studio Max	Quake II massive1.dm2 (frames p/s)		3D Studio Max	Quake II massive1.dm2 (frames p/s)
AMD K6/2 300	Socket 7	\$310	19	54	333MHz	20.9	56
AMD K6/2 333	Socket 7	\$360	20.9	56	350MHz	22	59
Cyrix/IBM 6x86MX PR233 (200MHz)	Socket 7	\$125					
Cyrix/IBM M II-300/6x86MX (233MHz)	Socket 7	\$215	12.6	19	none		
Intel Celeron 266	Slot 1	\$200	22.4	41	400MHz	33.3	60
Intel Celeron 300	Slot 1	\$230	24.5	45	450MHz		66?
Intel Celeron 300A	Slot 1	\$360	29	50	450MHz	43.9	70
Intel Celeron 333	Slot 1	\$465	32.1	55	none		
Intel Pentium II 300	Slot 1	\$510	28.8	52	350MHz	33.3	60
Intel Pentium II 333	Slot 1	\$570	31.9	56	400MHz	38.3	66
Intel Pentium II 350	Slot 1	\$700	33.3	60	450MHz	42.9	69
Intel Pentium II 400	Slot 1	\$1,130	38.3	66	450MHz	42.9	69
Intel Pentium II 450	Slot 1	\$1,630	42.9	69	none		

Bang per buck

	3D Studio (rated speed)	Quake 2 (rated speed)	3D Studio (overclocked)	Quake 2 (overclocked)
Celeron 266	0.112	0.205	0.1665	0.3
Celeron 300A	0.080555556	0.138888889	0.121944444	0.194444444
PII 333	0.055964912	0.098245614	0.067192982	0.115789474
PII 350	0.047571429	0.085714286	0.061285714	0.098571429

Absolute performance

	3D Studio	Quake 2	3D Studio	Quake 2
Celeron 266	22.4	41	33.3	60
Celeron 300A	29	50	43.9	70
PII 333	31.9	56	38.3	66
PII 350	33.3	60	42.9	69

The tables tell the story. In performance per dollar, the Celeron 266 wins even before you overclock it and isn't far shy of the pack in general operation. For maximum speed on a budget, though, the new Celeron 300A gives Pentium II 450 performance for less than a quarter of the price.

For the purposes of these tables, it is assumed that the Pentium II processors can be overclocked two 'notches', to 400MHz for the 333 and to 450MHz for the 350.

Prices at time of writing: Celeron 266 \$200, Celeron 300A \$360, Pentium II 333 \$570, Pentium II 350 \$700.

Performance figures source: Tom's Hardware Guide: <http://www.tomshardware.com/releases/98q3/980824/index.html>

What to choose

At the time of writing, you can pick up a Celeron 300A for \$360 or a Celeron 266 for \$200.

The Celeron 300A is to the Celeron 333 as the older Celeron 266 is to the original 300 model. The 300A is slightly slower than the 333, but it's more likely to overclock successfully. Since you get 90% of the performance from the 300A, and the 300A is noticeably cheaper, it's the chip of choice for speed freaks, while the rather cheaper 266 is the bargain hunter's favourite.

Running at 400MHz, the Celeron 266 performs a little better than a Pentium II 266 for business applications, and like a Pentium II 350 for 3D rendering number-crunching and 3D games like Quake II. Given that Pentium II 266 performance is fast enough for all but the most spectacular database and spreadsheet operations, and that the Celeron 266 presently costs \$200 against the Pentium II 350's \$700, this is a pretty good deal.

To be fair, you are quite likely to be able to overclock a Pentium II 300 to 350MHz, and a Pentium II 333 to 400MHz, so you can get a 350MHz Pentium II for not much more than \$500 as I write this. But it's still a big

price difference, even if you manage to wring 350MHz out of a \$400 Pentium II 266.

The new Celeron 300A is almost as remarkable a performer for the money. At 450MHz, it essentially level-pegs with a 450MHz Pentium II, the fastest desktop processor Intel currently makes. It's possible to see differences between equivalently clocked Mendocino Celerons and Pentium IIs, but only in heavy-duty server applications. It doesn't otherwise matter what operating system you're running or what application you're using.

Since you're unlikely to be able to get 450MHz performance from any Pentium II below the 350 model, you'll be paying at least \$700 at the time of writing to match the performance of a \$360 Celeron 300A. A genuine Pentium II 450 presently lists for more than \$1,600, four times the price for the same speed.

What's the catch?

There are a few caveats prospective Celeron-stretchers should bear in mind.

First, 'It won't overclock!' is not a valid reason to take back your new Celeron. It will very probably work at 100MHz FSB, especially if it's a 266 or a 300A and you

use a third-party CPU cooler. But if it doesn't, tough.

The Celeron 300A and 333 also aren't supported by all Slot 1 motherboards. This is no big deal for any recent Slot 1 board; BIOS updates to make all current Slot 1 boards work with the new model Celerons are already available. Make sure any board you buy has a compatible BIOS version, though, because you can't boot the computer to update the BIOS if your processor doesn't work.

Power users should note that both new and old Celerons cannot be used in multi-processor applications without some very careful board modification (see the section on modifying Celerons for dual processor operation at <http://www.cpu-central.com/dualceleron/index-dc.html>, and Tom's Hardware Guide Celeron/Pentium II comparison at <http://www.tomshardware.com/releases/98q3/980824/index.html>).

And that's about it for the drawbacks.

The Celeron is a good idea for anyone looking for lots of power on the cheap, even if they don't intend to overclock their processor. But if you *do* intend to run the chip faster than the label says, the Celeron could have been made for the purpose. ■

While Windows 95 is well equipped for multimedia, carefully chosen add-ons can improve the experience. By Kieran McNamee

Windows 95

Multimedia, as its name suggests, refers to the use and combination of different forms of media. Windows 95 provides much support for multimedia through in-built interfaces, the playback of multimedia files and the ability to install a wide range of multimedia hardware. The biggest multimedia component for Windows 95 recently has been the new Microsoft Media Player, which has increased the capabilities of Windows 95 to play back multimedia files quite considerably. Of course, if Windows 95 doesn't have all the multimedia tools you require, there are quite a number of third-party applications that may be of use.

Multimedia in Windows 95

Windows 95 provides a wide range of support for multimedia files and multimedia hardware. Though there are myriad file extensions relating to multimedia, the main ones Windows 95 users will come across are AVI, WAV and MID.

AVI stands for Audio Visual Interleave and is the standard video file for Windows 95. There are also the MOV (movie) files that originated with the Mac, but the Apple QuickTime program is required to play them. Waveform (WAV) audio files are probably the most used multimedia files on any Windows 95 system. The sounds that play when Windows starts and exits, and all your audible alerts are stored as WAV files. The MID file extension is short for MIDI (Musical Instrument Digital Interface). The MIDI standard is based on the hardware used to record and play music, and the way in which the music is recorded. MIDI files tell an instrument (which may be the software driving your soundcard, or an externally connected instrument) what and how to play. Unlike WAV files, MIDI files do not contain digitised sound. MIDI files are not as common as WAV files but a number of them are installed with Windows.

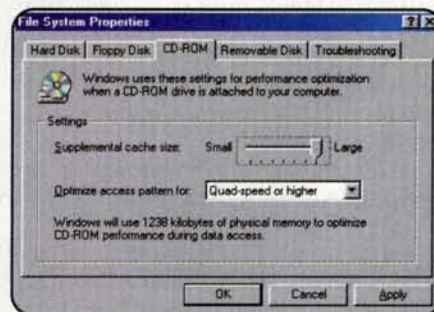
The main media interface within Windows 95 is the Media Control Interface (MCI). The MCI is a high-level API (Application Programming Interface) that allows multimedia applications to make plain-English commands, such as 'play cd audio'. These commands are then interpreted through the MCI and the MCI driver for the particular device. Another multimedia interface is the Display Control Interface (DCI). The DCI functions in much the same way as the MCI, providing enhanced video support for display devices.

The main built-in media programs of Windows 95 are the Media Player, the Sound Recorder and the CD Player. There is also built-in OLE (Object Linking and Embedding) support that allows you to copy or link media files into other documents.

CD-ROM

When CD-ROMs first hit the market, the concept of multimedia took off. The 'multimedia' catchword was added to all CD-ROMs, and making your humble PC a multimedia juggernaut was as simple as adding a CD-ROM drive and a soundcard. Nowadays the CD-ROM and soundcard are pretty much standard fare, but they are still the backbone of any multimedia application.

Windows 95 provides a 32-bit CD-ROM file system (CDFS) that improves performance for drives that are 2x or faster. You



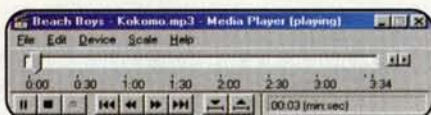
can optimise your CD-ROM drive's access pattern and supplemental cache through the Control Panel's System applet. Click on the Performance tab, and then click the File System button. Set the access pattern option to the appropriate option for the speed of your drive. If you have more than 12M of RAM then you should set the supplemental cache size to Large, otherwise a setting somewhere in the middle will provide the best performance.

The supplemental cache provides a separate hard-disk cache so that your normal file cache is not overburdened when a multimedia stream is being run. This cache is more complex and uses priority-based schemes for the smooth playback of multimedia streams.

The new Media Player

If you have ever used the Media Player that comes with Windows 95 you would have noticed it is pretty ordinary and can't play much more than your standard WAV, MIDI and AVI files. To play anything like an MP3 or a RealAudio file requires additional programs to be installed. Microsoft has overcome this shortcoming by releasing a new add-on (which can be found on apcmag.cd) which runs from the file MPLAYER2.EXE and is able to play most, if not all, of your multimedia files. The only problem with installing the new Media Player is the fact that some file associations you have for





your multimedia files are changed. If you don't want Media Player to be the default program for all multimedia files, you may have to edit some file associations.

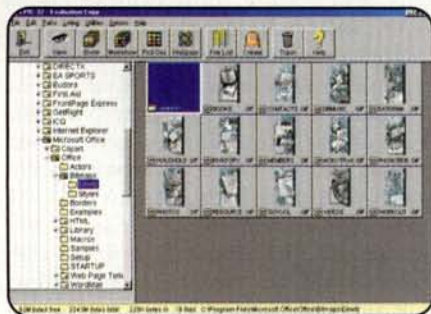
The new Media Player has many features and can be configured to a certain degree. An impressive feature of Media Player is its ability to automatically download new codecs from Microsoft and third parties when they become available. This feature ensures you will always have the ability to play almost any multimedia file with Media Player.

Media Player also incorporates and replaces Netshow, Microsoft's earlier attempt at streaming multimedia. With the ability to play the streaming Netshow files as well as RealAudio and RealVideo files, Media Player is likely to become the dominant program for playing multimedia over the Internet and corporate intranets. Microsoft has also incorporated a media showcase into Media Player which is a lot like the content service provided with RealPlayer.

Though Microsoft is once again encroaching on other developers, having one program to play all your multimedia files is a good idea. However, some Windows 95 users (and I am one of them) prefer the specialist players for certain media files instead of the generic Media Player.

Other multimedia goodies

When the multimedia features of Windows 95 are not enough, it's time to turn to third-party applications. Here's a brief look at five exceptional programs that will improve the way you work with multimedia. The evaluation versions of each program can be found in the Workshop section on apcmag.cd.



CPIC32 is a multimedia viewer that supports all types of multimedia files. Your system's directory structure is set out on the left and the contents of each folder are displayed on the right. Different multimedia files have specific icons that reveal whether they are sounds, images or something else. Thumbnails can be created so that you know what an image looks like before opening it, and changing image files to a different format can be performed with the batch conversion feature.

Multimedia files can be instantly viewed or played from within CPIC32 and the contents of a folder can be viewed as a screen show at the click of a button. The raw data of binary files can be viewed, as can the contents of a text document. An interesting feature that may prove useful to some is the ability to display the usually hidden tab and carriage-return characters in text files.

Those who are ultra-organised can keep track of all their image files by creating a picture index. The picture index has



a number of options that allow customisation of the final output's appearance. CPIC32 also offers TWAIN support for image-capturing devices such as scanners.

Multimedia Xplorer provides an easy-to-use interface for viewing, listening to, and organising all your media files. Perhaps the biggest feature of Multimedia Xplorer is its little utility called the Multimedia Detective. If you are ever curious about what multimedia items you actually have on your system, the Multimedia Detective will be able to tell you. Just give it a minute or two and it will return details on the number of images, videos, sounds, icons and cursors you have, along with the location of each item. I was amazed to find out that there are over 2,000 images scattered throughout my system.

Multimedia Xplorer has a number of other exciting features that are well worth a mention. Facilities to create and edit slideshows are available, while batch-processing capabilities allow you to change the format of images and create a set of thumbnails. By placing tags on specific



multimedia files in different locations, you can refer to them all at once when copying, moving or deleting them, or when adding them all to a ZIP file.

Jet Audio is an awesome audio and video player with a ton of features. With an interface just like your home audio system — if you have one of those really expensive setups — Jet Audio is visually spectacular and fairly easy to use.

Just like a component-based stereo, Jet Audio has different sections that look after each kind of media. There's the digital video player, the MIDI player, the digital audio player, the CD player, plus a sound effector and mixer. Each section can be hidden if not needed. The sound effector allows you to add reverb or 3D effects to your audio and there are four presets if you don't want to play around with the knobs. The mixer provides a number of volume controls as well as an equaliser. There is a lot to play around with and if you're not careful you can end up with settings that are far from perfect, and difficult to reverse. Jet Audio also has the ability to retrieve disc and track information from Internet CD databases (CDDBs), which saves you from manually entering the details of all your CDs. Like all the other multimedia programs looked at here, Jet Audio supports basically every type of multimedia format.

WillowMEDIA is similar to Jet Audio. It has a few more functions, but it is not as attractive. Along with a CD player, audio player, video player and MIDI player, WillowMEDIA has an alarm clock and an answering machine.

There are more knobs and switches to fiddle with than Jet Audio. Settings can be saved as presets and called upon by pressing the appropriate button. Multiple media types can be played simultaneously, so if you want to listen to a WAV sound while watching an AVI movie, you can.

Those who like to play around with sounds and music will find the demo version of **Sound Forge** on apcmag.cd. This beaut program allows you to mess around with music files and can provide hours of fun for the whole family. ■

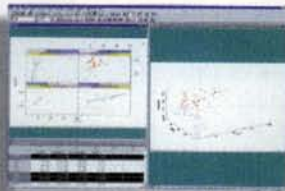
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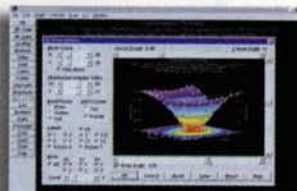
Fast graph creation starts with SigmaPlot's award-winning interface. Take advantage of industry standard menu and toolbar design to create graphs which are anything but standard. Quickly select the graph type you want to create from the easy-to-read icons of the Graph Toolbar. The interactive Graph Wizard leads you through every step of graph creation. Set your favorite graph preferences with Graph Defaults. And, to create similar graphs again and again, make your graph a template.



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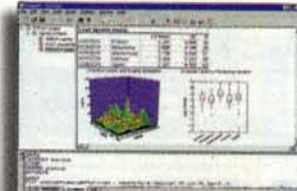
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TableCurve 2D TableCurve 3D

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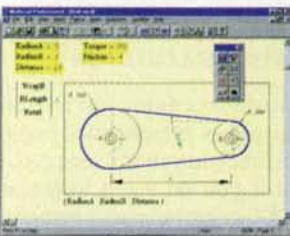
With ultra fast 32-bit performance, multitasking and background thread fitting on Windows 95 and NT, only TableCurve 2D and 3D quickly discover best fit equations for your data. TableCurve 3D offers sophisticated gradient and shaded surface plots and stunning animation that rotates a graph through a succession of viewing angles. TableCurve 2D and 3D also contain four smoothing methods (FFT, Lowess, Savitsky-Golay and Sequential Polynomial Interpolation).



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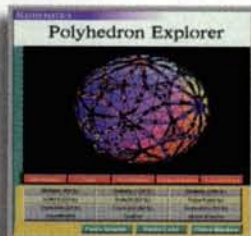
SYSTAT's core strength derives from the breadth, depth and robustness of its statistical procedures. Built upon this foundation is one of the most extensive and interactive library of graphical tools available on the market. Researchers can rely on SYSTAT to bring their data to life and deliver accurate results—even with the most unsavory data sets. Serious researchers, like you, can rely on SYSTAT from data to discovery.



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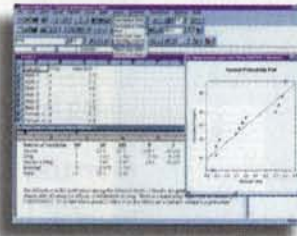
Mathcad lets you integrate real math notation, graphs and text in a unique interactive worksheet. So it's the perfect tool for performing, documenting and communicating your technical work. Plus you get even more math power and richer analytical, reporting, and presentation capabilities including Open GL® 3D graphics. Built-in Web-based publishing and collaboration tools, make it easy to share your results.



Mathematica

QUICK, ACCURATE, NUMERIC AND SYMBOLIC SOLUTIONS

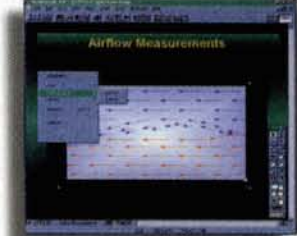
This complete environment for calculating and communicating in science and technology already delivers computing power to over one million people around the world. Breakthrough new features, such as an innovative typesetting system that can do maths, now make Mathematica even easier to use. Known for delivering quick, accurate numeric and symbolic solutions. Mathematica is ideal for creating interactive technical reports, presentations and courseware.



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Meet REXX — OS/2's scripting language.

By Christopher Relf

OS/2 Warp

REXX is something I've mentioned very little of in the past, as I thought it was not really that popular in Australia — but readers have proved me wrong. After receiving several emails (and even a couple of phone calls) from people asking about REXX, I've decided to introduce the topic this month.

What is REXX?

Often called a "glorified batch programming language", Restructured Extended Executor language is usually left to the power user wanting to milk OS/2 for all it's worth. However, with a little guidance almost all of us can become power REXX users. REXX was designed way back in 1979 by Michael Cowlshaw at IBM's UK Laboratories. It was initially intended to be a scripting language for the IBM main-frame computer operating system. Compared with other programming languages (such as C++), REXX commands are more logical and less complicated. For example, most other languages use a command like print to get information to the screen, whereas the REXX equivalent is say.

Why is REXX different?

Most of the commercially available programming languages are compiled languages, whereas REXX is an interpreted language. This means that REXX reads and executes each line in turn before going to the next one (like the way batch files are processed), rather than having to compile your instructions into executable machine code. Unfortunately, REXX is a little slower

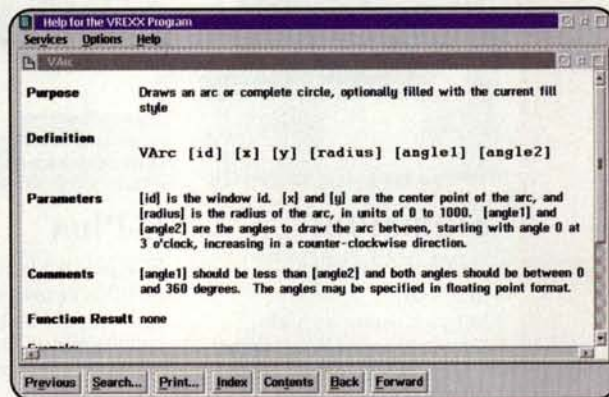
than other programming languages because of this line-by-line execution.

So why bother if it's so slow? Well, our friends at Big Blue have a way of getting around this slowdown — whenever you run a new REXX program (or if the code has been altered since it was last run) the REXX interpreter analyses the program and then 'tokenises' your source code. These tokens are stored alongside your program as extended attributes (see APC November, page 160 for more on extended attributes), so when you call up your program again, the REXX interpreter ignores your source code, and uses the smaller, faster, tokenised version instead. Of course, this method is much faster than reinterpreting the whole program again. Unfortunately, very large programs can't be stored as tokens in the extended attributes, because there is an upper limit of 64K. And you thought extended attributes were only for storing long filenames!

Getting started with REXX

Firstly, if you want your REXX program to run, it needs to have an extension CMD (for example, ROGER.CMD); this tells the REXX interpreter the file is a REXX script. Secondly, REXX programs will only run on your workstation in an OS/2 session — both Win-OS/2 and DOS get a little upset if you ask them to deal with REXX files. Thirdly, a small quirk of the REXX interpreter is that it will not interpret a file unless its first line is a comment. Comments can be anything you want (they are usually the filename, title, author, date and version) but they must be enclosed by /* and */ (just like in C++). For example, the beginning of a REXX program could be:

```
/* CROSS.CMD, Compare
Jason and Eddie, Billy-Bob,
25DEC98, v0.4b */
```



A comment can run over several lines so as to fit in more information:

```
/* CROSS.CMD
   Program to Compare Jason and
   Eddie

   Written by Billy-Bob Boxcar Ray
   Date: 25DEC98
   Version: v0.4b
*/
```

Using variables

A variable's name can be from one to 250 characters. Names must begin with one of the following characters: A-Z, a-z, !, ?, or ; but if you do use a lowercase letter, the REXX interpreter will convert it to uppercase. Examples of legal variables include Chocolate, !smith and ?WHAT?, whereas 1dayatatime, @thehop, and *andobelisk are going to cause problems.

Assigning variables is much the same as in other languages. To assign a variable to a numerical value use: Jason = 60.

For characters (or 'text', as it is sometimes called): Eddie = "Nine".

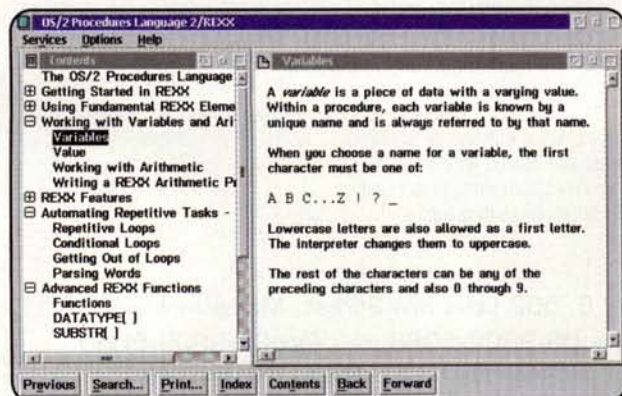
Numerical variables can be operated on (what we normal people say as using +, -, * and /) as follows:

```
Average = Sum / Number
Total = First + Second + Third + Last
```

Now, say you want to display the value of a variable to the screen.

```
SAY Eddie
SAY Jason
```

So, our little program could be:




```

/*      CROSS.CMD
Program to Compare Jason and
Eddie

Written by Billy-Bob Boxcar Ray
Date: 25DEC98
Version: v0.4b

*/
Jason = 60
Eddie = 9
Together = Jason + Eddie
SAY Together

```

Our output should be: 69.

Note that if we hadn't defined the variable Together, then the output would have been: Together.

Adding OS/2 commands

A very powerful technique to use in any programming language is to rely on another program to make things work.

Numerical expressions

Let A=4 and B=2, then

Addition +	A+B=6
Subtraction -	A-B=2
Multiplication *	A*B=8
Division /	A/B=2
Powers **	A**B=16
Concatenation	A B=42

The REXX interpreter evaluates each line, one at a time, and if the line doesn't start with a keyword instruction, a variable definition, a label or a null operator, it will be passed directly to the command prompt. This means that anything the REXX interpreter can't handle is spat at OS/2 — if OS/2 sees it as a valid command, then it will be processed just as if it was typed at

the command line. You can also call other programs to the rescue.

For example, say you wanted to back up the contents of a particular directory on the hard drive to a floppy disk in B:. An example program would be:

```

/* Backup.CMD
Program to Backup stuff
from HD to Floppy
Written by Johnny Apple-Seed
Date: 25DEC98
Version: v1.4b

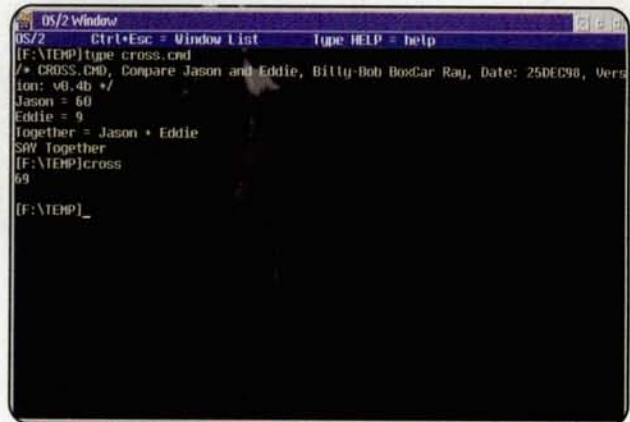
*/
SAY "Backing up the directory to b:."
"COPY" *.* b:
SAY "Backup Complete!"

```

Note that the COPY command is in quotes — this ensures the REXX interpreter will pass it to the command prompt even if you have a variable called COPY in your REXX program.

Visual REXX

If you already have a lead on programming and want to jump ahead to the really heavy stuff, Visual REXX is a neat little freeware package of REXX extensions which allows REXX programs to draw graphs and charts, as well as take full control of Presentation Manager dialog boxes (those annoying things that pop up every now and then, such as the 'Are you sure you want to delete this file?' dialog). There is extensive online help to assist you in the included example programs, showing you how to create dialog boxes, windows and scroll bars.



Visual REXX is available from most OS/2 FTP sites as VREXX2.ZIP, and we have included a copy of it on **apcmag.cd** for you to play with. It's worth printing out the README file, just to get an idea of what Visual REXX can do (mind you, it's 56 pages!).

Other third-party packages are available, including a trigonometric extension package (RXMATH.ZIP), NetBIOS connection (RXNETB.ZIP), and many interfacing packages between REXX and other applications. There's even a 'compiler' that will make executable versions of your REXX CMD files.

An extensive REXX resource is held at Link Everything Online (<http://www.leo.org/pub/comp/os/os2/leo/rexx/>), including a large collection of programming documentation.

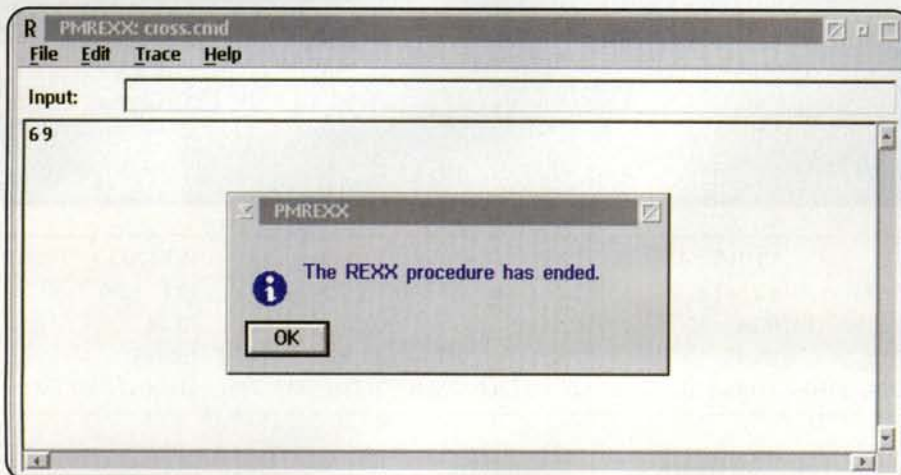
What if I need help?

Luckily, IBM is committed to providing detailed online support; you can access REXX information from the OS/2 Procedures Language 2/REXX document in the Information folder. This document contains a listing of all the REXX functions available and some information on how to use them.

If you're really game, you can even try to tie in some multimedia to your REXX program — see the online book, Multimedia with REXX, in the Multimedia folder.

In next month's column, I'll continue with a few more REXX command features, including getting input from the user, decision making, error levels, and debugging techniques.

APC welcomes readers' input. Ideas or suggestions for OS/2 Workshop can be emailed to the author at Christopher.Relf@tip.csiro.au.



CTX

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SILVER AWARD IN PERFORMANCE AND QUALITY FROM PC HOME (UK), JULY 1998



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2 Sony Multiscan
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PC and Mac • (800)
332-7689 • www.sony
.com/displays

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Neil Sedaka told us 'breaking up is hard to do'.
Fortunately, backing up isn't. **By Stephen Withers**

Mac OS

Backing up your files is a bit like that six-monthly visit to the dentist — if everything goes well, it's a waste of time; if there is a problem, it helps limit the damage and keep the repair bill to a minimum.

Daily dental care is fairly standardised, but appropriate backup regimes vary considerably. My livelihood is largely dependent on the files I create (plus an accumulation of email), so I've adopted an industrial-strength solution.

The premier backup program for Mac OS is Retrospect (developed by Dantz, <http://www.dantz.com/>, and distributed by Lidcam, <http://www.lidcam.com.au/>). It will back up just about any set of files to practically any type of removable media. One advantage of Retrospect is that it will handle multiple volumes in one hit. This is an important consideration for me as I have three hard drives currently partitioned into a total of five volumes, and lesser programs expect me to back up each one separately.

With optional client software, one copy of Retrospect can back up files from multiple Mac OS and Windows systems on a network. I could use this feature to back up my PowerBook and PC, but at the moment I find it more convenient to copy important documents into appropriate folders on my Power Mac 7500. This way I don't need to make sure all the computers are switched on at the time scheduled for backup. In a corporate environment, Retrospect has a great feature which allows notebooks computers to be automatically backed up when they reappear on the network.

Retrospect handles most types of removable media including tapes, disks and CD-R. I use a DAT drive, which is on the expensive side but is fast, spacious and convenient. My backup pattern uses three sets of two tapes, rotating the media every two weeks. A full backup is scheduled for every Friday (to tape A one week and tape B the other), with incremental backups on the other evenings (to A on Mondays and Wednesdays, and to B on Tuesdays and

Thursdays). If it wasn't for the fact that my email database is the best part of 200M and changing daily, I would be able to rotate the media less frequently.

With the right hardware, this combination of full and incremental backups is very convenient. It minimises the number of pieces of media required, so that in the event of a disaster you may be able to do a complete restore from one tape.

However, full backups of your system aren't essential. It's no big deal to reinstall system software from CD-ROMs, and in any case, a major catastrophe will probably mean reinstalling the OS and the backup software in order to restore the rest of your files. Retrospect 4.1 (not released in Australia at the time of writing) comes on a bootable CD-ROM that can be used to restore a backup set, without requiring any intermediate software installation.

Reinstalling software isn't much trouble these days: by and large, if a program doesn't fit on a single floppy, it is supplied on CD-ROM. This trend is likely to intensify with the arrival of the floppyless iMac. Consequently, installers can run unat-

freeware and shareware, it might be more cost and time-effective to download a fresh copy if you ever need it. Always keep an extra copy of anything you consider essential, which includes all items used for Internet access. (Remember that some key items, including browsers, can be found on **apcmag.cd**, so you may have a ready-made backup.)

In the case of software purchased electronically, it depends on whether it's a program delivered to you via the Internet rather than on a physical medium, or if it can be downloaded free but a purchased code number is needed to activate it. If you can't download the software on demand, be sure you have a backup copy. Any activation code will probably be delivered by email, but try to keep written or printed copies rather than relying solely on electronic records.

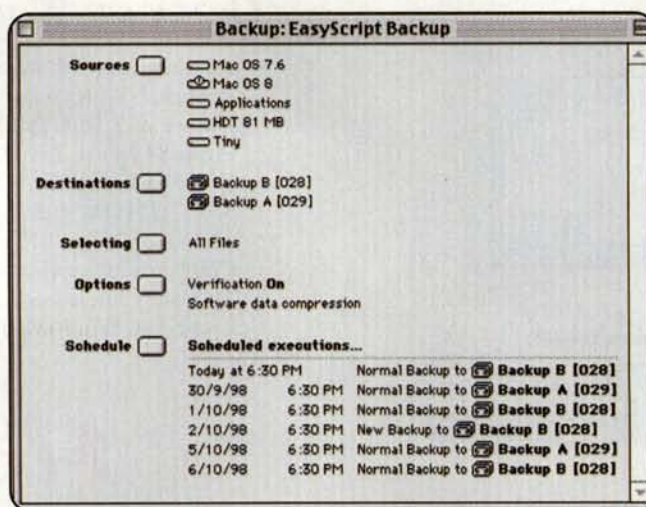
Priorities

Moving away from applications, the files which must be backed up are those you can't easily re-create. The obvious ones are your own documents, such as graphics, spreadsheets or word-processed files.

I find the best approach is to keep all my work in one folder or volume (which I unimaginatively call Documents). This folder needs organisation. If you subscribe to the 'strata' theory of desk management (documents of similar age are found at a similar level in the pile), all you need to do is use a list view for the folder and sort it by date modified so the newest is at the top. Even I need more organisation than that, though you might not think so if you saw the state of my desk.

What I do is create a few high-level folders for particular activities: one for APC articles, one for letters and faxes, and so on. Some of these folders require further division. For example, my APC folder contains a subfolder for each issue.

Assuming security is not an issue, you can extend this idea when several people share a computer: simply give each user a folder inside Documents and let them manage the contents themselves.



tended as you don't need to slot successive floppies into the drive. If you don't use many programs, you might be better off not backing them up. If worst comes to worst, simply reinstall each program as and when you need it.

When software is distributed via the Internet, you should check whether you really need to back it up. In the case of

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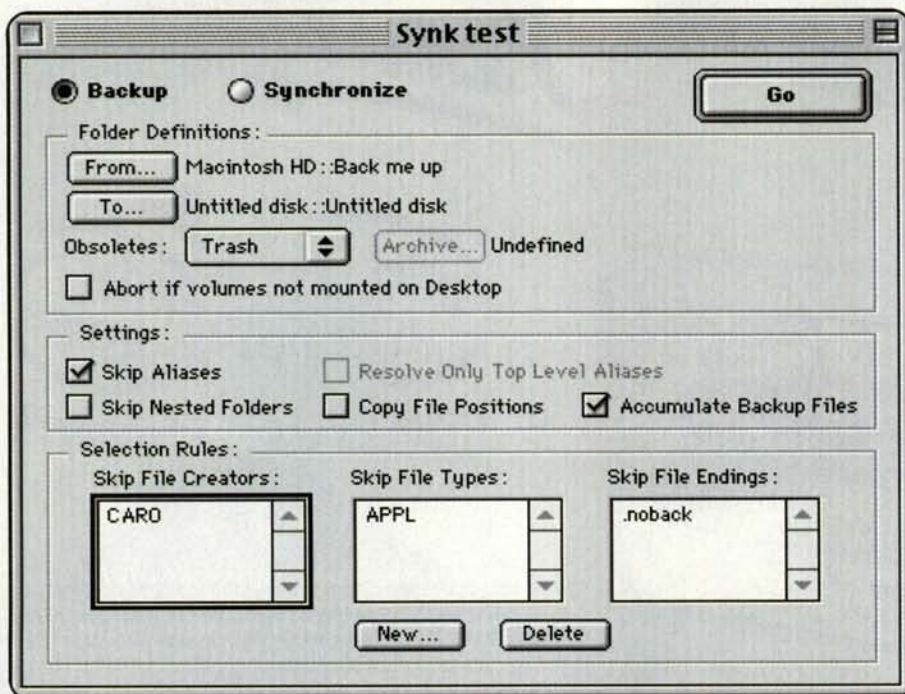
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There's another folder that you should back up regularly: the Preferences folder in the System Folder. With some applications, it doesn't really matter if you back up their preferences or not. Maybe you've never needed to change the default settings, or your changes are so few that it would only take a moment to reinstate them. In other cases, a backup is highly desirable. This could be because you have extensively customised the settings, but some programs store information that cannot be easily or quickly re-created.

This is particularly relevant when a piece of software has its own scripting or macro language and stores the scripts in the Preferences folder (such as ClarisWorks or OneClick), or where a large quantity of information is stored (for example, NewsWatcher and its derivatives store the complete list of newsgroups offered by your ISP; on my system this is a 500K-plus file).

Another application that stores large amounts of information is Internet Config's Internet Preferences file. Some Internet Config settings are easily remembered and manually restored, such as your preferred Web browser and newsreader, but others — especially those that specify how particular kinds of downloaded files are to be handled — are more subtle and can lead to considerable head scratching if the file isn't restored after corruption or deletion.

I mentioned that scripts and macros may be stored within the Preferences folder, but they can also be found in other locations. You might store custom Word

templates with your documents, but there's a good chance you'll keep them in the Microsoft Office 98:Templates folder with those provided by Microsoft. If you add macros to the Normal template, don't forget to back that up too.

Media

When you aren't backing up an entire hard disk, lower-capacity media become viable alternatives to tape. The day of the floppy is just about over as far as backup is concerned, unless your requirements are minimal. It still has its use for moving small files between computers, as well as archiving: I have a couple of hundred sitting in a cardboard box storing obsolete versions of shareware and OS-related updates.

Zip drives offer reasonable capacity and modest prices, but you're still looking at about \$150 for 500M of storage. (All media prices mentioned here were taken from a particular reseller's catalogue to allow fair comparisons, although you can probably find lower prices.) Imation SuperDisks are a little cheaper at \$125 per 500M, but the media costs are still relatively high if you need to rotate multiple sets of disks. My opinion is that such devices are useful for archiving, but their limited capacity may prevent unattended backups.

Moving up, the 1G and 2G Jaz drives and SyQuest's SyJet 1.5G unit are both big enough for a full backup of fairly recent hard drives, but the 1G Jaz and 1.5G SyJet disks cost about \$200 per gigabyte (there

are also new 2G disks available). However, they are fast, spacious and convenient.

I'm not sure that you'd buy a CD writer specifically for backup, but if you have one it is an attractive alternative. At less than \$6 per disc (say \$10 per gigabyte), the media costs are low even if the discs aren't rewritable (CD-RW seems to be coming slowly to the Macintosh world, although it and DVD-RAM, costing around \$1,900 for the drive and \$120 for a 5.2G disc, are supported by Retrospect). Since Retrospect uses a technique called packet writing, it is possible to put multiple incremental backups on one CD-R.

DAT tapes are relatively cheap at around \$50 for 4G (8G compressed), but as I mentioned the drives are rather pricey at about \$2,100. For demanding applications such as server or workgroup backup, a DDS3 DAT drive stores 12G (24G compressed) per tape and costs some \$3,100 plus \$133 per tape.

Software

Although Retrospect is widely bundled with tape drives, it's not the only player in town. Exabyte's 8mm and Mammoth drives aren't widely used with Macs, but are now supported by a program called Missing Link (see <http://puffindesigns.com/>). The program was developed by John Knoll, a visual effects supervisor at Industrial Light and Magic and co-creator of the original Photoshop. Missing Link reads and writes files to Exabyte tape drives in both Abekas and TAR formats for backup, and interchange with SGI and other systems. Various types of image files including QuickTime movies can be gamma corrected, resized and colour filtered during the process.

There are also a variety of shareware backup programs; here's a small selection that back up to Finder-mountable volumes.

Synk (shareware, \$US10) is flexible as it can accumulate multiple versions and skip files by type, creator or filename endings. It can also be used to synchronise files on two computers — hence the name.

Drag'nBack (shareware, \$US50) has a convenient user interface. To add new files to the backup set, drag them onto the application icon. Double-clicking the application refreshes the backup. It can use multiple floppies if necessary.

SimpleBackup (freeware) lives up to its name, backing up all the files pointed to by a collection of aliases stored in a particular folder. It can skip files which haven't changed since the previous backup, or remove deleted files from the backup. ■

Using Linux as a modem server for both regular dial-in and PPP access. **By Geoffrey Bennett**

Linux

Before we get our hands dirty, an explanation of Linux start-up and log-in handling will be useful. When you start Linux, the kernel initialises its device drivers, mounts your root filesystem, then hands control over to the 'init' program, which is responsible for bringing up the rest of the Linux system. These tasks can include mounting your other filesystems, and starting services such as your printer spooler.

The final task in booting Linux is for init to fire up one 'getty' process for each of your virtual consoles, terminals, and modems as appropriate. Getty is the first stage in accepting a login; it initialises the terminal line, prints a log-in prompt, accepts a username, and then starts the login. If the getty is being used on a modem port, there is an extra step: waiting for a call and answering it before printing the log-in prompt.

There are many different versions of getty, each optimised for a different use. For example, mingetty is a 'minimal' getty often used for virtual consoles, mgetty is a 'smart modem getty', and vgetty is designed for use with voice modems.

This article focuses on the use of mgetty, as it is capable of initialising the modem, answering the modem itself (rather than using the auto-answer modem feature), and is able to share the modem line with other processes (for example, if you want to use the modem to dial out). mgetty can also be used in conjunction with 'sendfax' to receive and send faxes, but this article won't cover that.

The reason manual-answer is better than auto-answer is that if mgetty is not running (for example, if your computer is turned off), the modem won't answer the phone, and the person dialling you won't get annoyed that they have paid for a phone call to a modem without a computer.

Setting up the modem

Before setting up mgetty to allow dial-ins, the modem must be configured correctly. We'll assume that Linux knows about the serial port your modem is plugged into; this will almost certainly be the case if it is plugged into COM1 or

COM2. See the Serial-HOWTO if this is not the case, or if Linux can't seem to see your modem.

Under Linux, serial ports are referred to by their entries in the /dev directory; for example, /dev/ttyS0 and /dev/ttyS1 correspond to COM1 and COM2 respectively. This article will assume your modem is attached to COM2; if your modem isn't, adjust the examples appropriately.

It is recommended that you don't use the /dev/modem symlink or the /dev/cua* devices at all if you are using the modem for dial-in. To set up the modem, you'll need to use a communications program such as minicom, which can be found in a package by the same name if you are using Red Hat Linux or Debian GNU/Linux.

Run minicom -s to invoke the set-up mode of minicom, and you'll be presented with a menu. Select Serial Port Setup, then Serial Device, and change this to the device your modem is attached to (in my case, /dev/ttyS1). The default speed of 38,400bps should be fine (at least for the moment); hardware flow control should be left on, and software flow control off. Go to the Modem and Dialing option next, and delete everything in the init string field (we'll be doing this ourselves). Finally, select 'Save setup as df1' followed by 'Exit', and you'll be dropped into minicom's terminal screen.

If you now type 'AT' followed by Enter, the modem should respond with 'OK'. Your modem manual may come in handy in setting up the modem; the important settings and their corresponding commands for most modems are shown in the table below.

Since we've saved the settings we want, the modem can be initialised later with

AT&F	Resets to factory settings.
AT&C1	DCD signal follows Carrier Detect state (needed to detect if a user hangs up).
AT&D2	Lowering DTR while online hangs up and returns to command mode.
ATS0=0	Disables auto-answer.
AT&W	Saves active settings to memory.

just 'ATZ'. When you have finished with minicom, press Alt-Q, or Esc followed by Q in quick succession.

Setting up mgetty for dial-ins

Now that the modem is set up, it's time to move on to mgetty. mgetty can be found in the 'mgetty' package in both Red Hat Linux and Debian GNU/Linux. Once it's installed, you'll see the following configuration files in /etc/mgetty or /etc/mgetty+sendfax.

dialin.config	Used to restrict dial-ins based on caller ID.
login.config	'Login Dispatcher' (we'll use this later when setting up AutoPPP).
mgetty.config	Main configuration file.

Open the mgetty.config file for editing, and adjust the options to suit. The following options are of particular interest.

debug	Debugging level; bigger numbers mean more detail: '0' turns off all debugging information; '4' is reasonable when setting up mgetty.
speed	Communications speed between the computer and modem. Leave it at 38,400 for testing; you can increase it later.
init-chat	Since we've already configured the modem, just set this to: init-chat "" ATZ OK
data-only	Unless you want mgetty to receive faxes, add in the line: data-only y

Finally, we need to tell init that we want mgetty to be run on the modem lines. To do this, add a line to the end of


```

S1: 2345: respawn: /sbin/mgetty ttyS1
      |
      | Device for mgetty to control (/dev not needed).
      |
      | Command for init to run.
      |
      | Tells init to restart mgetty when no process is using the line (such as when a user logs off).
      |
      | Run mgetty in runlevels two through five.
      |
      | Identifier for init (must correspond to the device name).

```

Figure 1

/etc/inittab such as the one shown in Figure 1 above.

After modifying the inittab file, you can type `/sbin/telinit q` to have init reread its configuration file. If you have an external modem, you should see the lights flicker for a moment as mgetty initialises the modem.

Now that init and mgetty are set up, try dialling into your Linux machine using any communications program. mgetty should answer the phone within a few rings and then present you with a login: prompt from which you can log in. Note that you probably won't be able to log in as root (for security reasons), so you should first set up a regular user ID that you can use.

PPP

Once you have tested to make sure that regular dial-in is possible, you can configure PPP dial-ins. There is more than one way to do this, but the first step in any case is to make sure that the PPP package is installed.

The next step is to decide how PPP is going to be started. There are three basic options:

- Let the user log in like you did above, then if they want a PPP connection, they can start PPP manually.
- Let the user log in with their username and password, and have PPP started automatically.
- Use PAP (Password Authentication Protocol) authentication so the user doesn't need to write a log-in script to automate the connection.

We'll only cover the third option, as it's usually the most common and convenient way for people to connect to your PPP server. The PPP-HOWTO has information on setting up the first option, and the second option can be done as an extension of the first: set the user's shell to a script you write which contains the command to start PPP.

To enable automatic PAP logins, edit mgetty's `login.config` file, and search for the line which is similar to: `#!/AutoPPP/-a_ppp /usr/sbin/pppd auth -chap +pap login`.

Uncomment the AutoPPP line by removing the '#' from the front. This tells mgetty that if the user starts PPP on their computer without logging in, then mgetty should start PPP immediately. The 'auth' and 'login' options tell your PPP server that it should request the username and password using PAP.

In the `/etc/ppp/pap-secrets` file, add the line: `* * * * *`

This line specifies that any user on your system can log in and authenticate with PAP using their regular password.

You will need to assign an IP address to each dial-in line as well as specifying a number of other options. Options can be specified on the command line (in the `mgetty.config` file), in `/etc/ppp/options`, or in `/etc/ppp/options.ttyname` (where `ttyname` is, for example, `ttyS1`). The difference between the two options files is that

from a local Ethernet; for example, if you have an Ethernet card in your machine

lock	Use locking.
modem	Use modem control lines (CD and DTR).
asyncmap 0	Don't escape any control characters.
crtcts	Use hardware flow control.
proxyarp	Make the remote IP address appear to be on the local Ethernet.

connected to a network with IP addresses 10.2.3.0 through to 10.2.3.255 and you assign your dial-in user(s) an address in that range. If you don't have an Ethernet card, or if the IP addresses you are assigned aren't in the range covered by the Ethernet card, then you shouldn't use the `proxyarp` option.

If the dial-in user is using Windows, you may want to specify the 'ms-dns' option, which can be used to automatically set their DNS server to the value you specify. You also need to specify the IP addresses that are to be used for the PPP link as `localip:remoteip`. For our example network in Figure 2, we'd use the option '10.2.3.19:10.2.3.20'.

One final thing to do before testing your PPP connection is to enable IP forwarding. Without this, your user will only be able to communicate as far as your PPP server. There is a kernel configuration option (`IP_FORWARD`) to enable this. Red Hat Linux comes with this option compiled in,

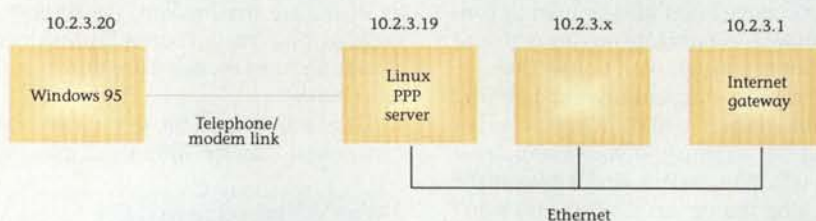


Figure 2

the former is used for all PPP connections (even outgoing PPP connections), whereas the latter is only used for PPP connections on that serial line. The options you'll probably want to include for all dial-in lines are shown in the table above left.

The `proxyarp` option should only be used if the remote IP address is one that is

but you need to make it active by setting the `FORWARD_IPV4` option in the `/etc/sysconfig/network` configuration file to 'true'.

If you have problems getting a PPP connection working, the place to check for error messages is `/var/log/messages`. The `tail -f` command can be very useful to see what is happening. ■

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Sorting — a few bits at a time.

By Michael Smith

Developers Corner

This month's Developers Corner has been through a few generations. I started by looking inside PKZip files. I then decided that decoding a ZIP file is no fun unless you can decompress the data, so I proceeded with a discussion. It soon became obvious, however, that discussing data compression within two pages was just not going to work. It's too complex without some background. So, following that revelation, I came to this month's topic: radix sorting. It's an interesting way of sorting data, and provides some background that will be important when we get back to data compression in a month or two.

Radix sorting for dummies

Let's imagine you've got a stack of cards, each of which has a three-digit number. How would you sort the cards into numeric order? One strategy you might try is to make 10 piles: cards numbered 0 to 99, 100 to 199, 200 to 299, . . . , 900 to 999. You might then repeat the process on each pile: breaking it into groups of 10 numbers, before finally sorting these small piles by some simple method.

Putting it a little more formally: radix sorting does not operate on a whole key, but on part of that key. The key is considered to be a number with radix (base) *M*. You partially sort the data into subsets using one or more digits of the key. These subsets may then be more easily sorted or recursively radix sorted into smaller subsets.

In our example we have used base 10 numbers (*M*=10). When working with computers, which use binary representation of numbers, it is generally more efficient to use *M*=2 or some power of 2.

This method of sorting is most effective where the key is long, and so a comparison of the whole key is costly in execution

time compared with the extraction of a small subset of bits from the key.

Key data

Before we write our sort code, let's start by defining a class to represent our data.

```
class data_t {
private:
    unsigned long k;
public:
    unsigned long key( void )
    { return k; }
    data_t& operator =(unsigned long newk)
    { k=newk; return *this; }
    unsigned bits( unsigned ndx, unsigned num
)
    { return (k>>ndx) & ~(~0<<num); }
};
```

k is our key data. I've chosen an unsigned long but any integral data type will do.

The method `key()` is an access function.

The assignment operator is defined to allow the manual assignment of a key.

The method `bits()` is provided to extract particular bits from the key.

Radix exchange sort

A simple and fairly logical implementation of a radix sort is the radix exchange sort. Here we start at the most significant bit and partition the data into two parts, depending on whether that bit is set. We then recursively partition each partition with the second most significant bit and so on; the data is completely sorted by the time we finish with the least significant bit. The behaviour of this algorithm is quite similar to the Quicksort algorithm discussed in February *APC* (see page 121).

// Radix exchange function

```
// a is an array of data
// l is the left index into a
// r is the right index into a
// b is the bit on which we are currently sorting
void rexch( data_t a[], int l, int r, int b )
{
    if (r>l && b>=0) {
        int ir=r;
        int il=l;
        while (il<ir) {
            while (!a[il].bits(b,1) && il<ir) il++;
            while (a[ir].bits(b,1) && il<ir) ir--;
            swap( a[il], a[ir] );
        }
        if (!a[r].bits(b,1)) ir++;
        rexch( a, l, ir-1, b-1 );
        rexch( a, ir, r, b-1 );
    }
}
```

```
// Radix Exchange Sort
void resort( data_t a[], int N )
{
    rexch( a, 0, N-1, 31 );
}
```

Straight radix sort

An unusual implementation of a radix sort is a straight radix sort. This algorithm sorts the data beginning with the least significant bit and progressing to the right. At first glance, this may appear to be unlikely to work. The critical factor in making the algorithm work is that the partitioning process must be *stable*. That means that data which have equal values for the partition radix must maintain their relative positions. If the partition is stable, then the whole thing falls into place.

A couple of other interesting optimisations are available. Instead of continually swapping, like the radix exchange sort, for each pass this algorithm builds a table showing the progressive total for each par-

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tition location — then relocates the data once for that pass. This means the algorithm runs in *linear time*, which makes it much faster than conventional sorting algorithms. Also, instead of examining only one binary digit at a time, you can partition using multiple digits — again leading to speed increases. Two restrictions exist on the number of bits per radix (m). The storage for the progressive totals must be an array of M values, where $M=2^m$. Secondly, the number of bits in the key (w) must be an exact multiple of m.

```
#define m 8 /* number of bits to look at at once */
#define M 256 /* 2**m */
#define w 32 /* bits in key */
```

```
void rsort( data_t a[], int N )
{
    int i, ipass;
    int count[M];
    data_t *b = new data_t[N];

    for (ipass = 0; ipass < w/m; ipass++) {
        // ZERO THE COUNTERS
        for (i = 0; i < M; i++) count[i] = 0;
        // COUNT THE VALUES OF THE SELECTED
        RADIX
        for (i = 0; i < N; i++)
            count[a[i].bits(ipass*m, m)]++;
        // TURN TOTALS INTO PROGRESSIVES
        for (i = 1; i < M; i++)
            count[i] += count[i-1];
        // COPY DATA TO PARTITIONED LOCATION
        for (i = N-1; i >= 0; i--)
            b[count[a[i].bits(ipass*m, m)]] = a[i];
        // COPY BACK FROM TEMPORARY STORAGE
        for (i = 0; i < N; i++) a[i] = b[i];
    }
    delete b;
}
```

A few words about bits

When performing radix operations, you often need to extract a particular set of bits from a number. In C and C++ this can be relatively easy using the shift operators (<< and >>), the bitwise 'not' operator (~) and the 'and' operator (&).

The << operator shifts all bits of a number to the left, and the >> operator shifts them to the right. So the number 3 (binary 00000011) would become 6 (binary 00000110) if left shifted by one place, and 1 (binary 00000001) if shifted to the right by one place.

The & operator performs a bitwise 'and' operation on its two arguments, for example:

```
a    01010101
b    00001111
a&b  00000101
```

This can be useful for extracting particular bits from a number. For example, $x \& 7$ will find the three least significant bits, as seven has the binary representation 00000111.

Performance

So are radix sorting algorithms worth the effort? I ran some benchmarks on a Pentium 120 under Windows 95 using Microsoft VC++ 5.0, sorting random numbers. I compared the two radix algorithms with a non-optimised Quicksort algo-

When referring to particular bits of a number, we usually refer to the least significant (rightmost) bit as bit zero, the bit immediately to its left as bit one and so on. The most significant (leftmost) bit of a 16-bit number will be bit 15.

To extract bit three from a number, we can use $x \& 4$. However this will yield a result of zero or four. A more useful expression would yield the result zero or one. This can be done using the shift operator: $(x \& 4) \gg 2$ or more commonly: $(x \gg 2) \& 1$.

The '~' operator performs a bitwise 'not'. That means it inverts the value of each bit.

```
a    00001100
~a   11110011
```

An interesting use of this is the expression ~0. The number zero has all bits set to zero. Thus ~0 will have all bits set to one.

A generic macro to get the n least significant bits of x would be: $x \& \sim(0 < n)$.

A generic macro to get bit n from x would be: $(x \gg n) \& 1$.

rithm. The results (in seconds) are shown in the table at the bottom of this page.

The radix exchange sort ran at comparable speeds to the Quicksort, though run times increased slightly less as the size of the dataset improved. The straight radix sort ran faster for small and large datasets and the rate of increase was also less.■

Number of keys	100,000 keys	250,000 keys	1,000,000 keys
Radix exchange sort	1.81	3.85	15.43
Straight radix sort	0.50	1.26	5.39
Quicksort	1.26	3.35	15.60

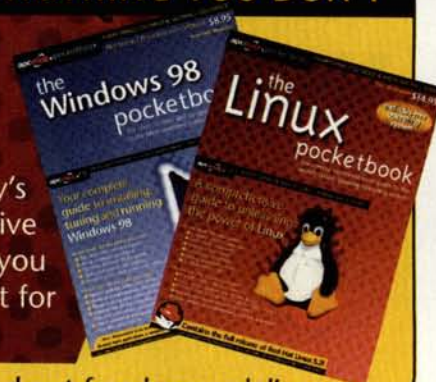
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The first in a series on Java programming.

By Travis Simon

Java

Welcome to a new Workshop series on Java programming. If you've ever wanted to write a program, an applet, or a server-side script, then this column is for you!

But why Java? Isn't that yesterday's news? Didn't Corel's Office for Java fail miserably? And aren't applets a complete waste of bandwidth? It's true that the Java language hasn't lived up to all its hype. And no, the Java language probably won't revolutionise the way we use computers. However, there are still many substantial reasons to learn to program in Java.

The Java column was originally conceived about a year and a half ago, when Java was still the hottest topic in computing. We then decided to write the JavaScript column as an introduction, due to the similarities in the languages. Since then, JavaScript has become the hot topic, and Java's fortunes have faded.

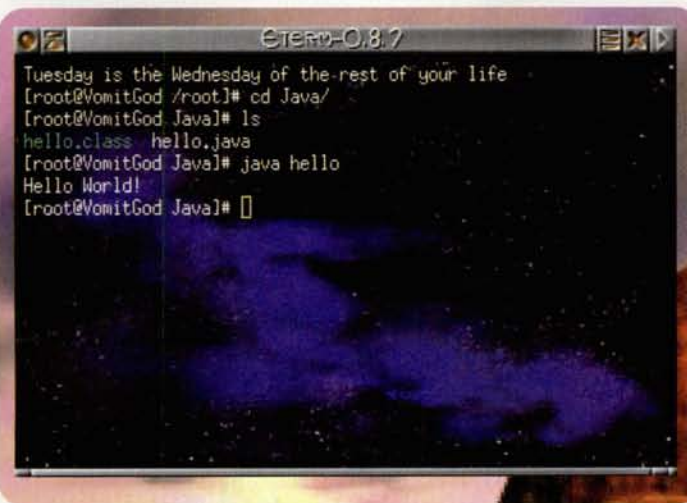
We have decided to proceed with Java because it is still one of the most elegant languages, and one of the most fun to program in. This column will not attempt to make a professional developer out of anyone. Instead, it will try to embrace and share with the reader that mystical and ephemeral ecstasy that programmers often feel when a program comes together — that fleeting moment when the boundaries between the programmer and the program become blurred. If you've never felt that before, it's a really magical moment, and is what makes programming such an enjoyable experience.

Who should read this column?

This column is for anyone who has an passion for computers. Perhaps you've browsed through the computer section in the bookshop thinking, 'I want to know that — and that — oh, and that looks interesting!'. Maybe the first thing you do when you get home after spending eight hours

working on a computer is turn on your computer. Or maybe you've read about the early hackers who used to transfer assembly code from computer to computer on punched cards, wishing you were there. It's a sad state of affairs (trust me, I know!), but you'll be in good company here.

This column will not spend lots of time on the basics of programming. If you're not familiar with basic programming concepts like operators, loops and conditional statements, have a look through the JavaScript tutorial on October's **apcmag.cd**. The tutorial should be online by the time this is published (probably at <http://apcmag.com/javascript/>), so if you don't have the October issue, check our Web site. Of course, the Java-specific implementation of these concepts will be covered, but I won't waste too much time on them when there is so much more to learn.



Throughout this column, I will assume that the reader is familiar with the JavaScript tutorial. C and C++ programmers should have no problem making the transition, however, due to the similarities between the languages. I will also be pointing out differences between Java and C/C++ along the way, so almost anyone with programming experience should be able to follow easily.

Which IDE should you use?

Please, do not go out and spend money on

a professional Java IDE (Integrated Development Environment). IDEs are great if you're a professional programmer and you need to churn out programs. They are not good for beginners. The only way to learn how to program is by writing code — all you need is a text editor, a Java compiler and a Java virtual machine.

We've included a number of development tools on **apcmag.cd**, so look there for information. Most users will probably want to use the Java Development Kit (JDK) from Sun. Tools for the various platforms can be found by browsing for the JDK at <http://www.javasoft.com/>. For the time being, I will be using the Java 1.1.6 version of the JDK, until the 1.2 version is released for Linux. Macintosh users should also see a recent Mac OS Workshop column (APC October, page 156) for more information about using Java on the Mac.

Linux users can either go to Sun's site (<http://www.sun.com/>), or pick up Kaffee and Guavac. Kaffee and Guavac are free implementations of the Java compiler and runtime environment. Linux users may also wish to recompile their kernel to include native support for Java applications. This lets you execute a Java application just as you would any other type of application, without having to manually invoke a virtual machine. Cool, huh?

Microsoft's Java products

Without wanting to go into too much detail, many vendors believe that Microsoft is trying to fragment the Java language by encouraging developers to generate Windows-only code. Microsoft will try to convince you that it's for the good of the computer industry, and for the good of Java. Java's strength is its cross-platform capabilities, and to use the Java language and not take advantage of that is a tremendous waste. The issue is so serious that Sun has taken Microsoft to court, claiming an infringement on the Java licence. If you want some more information about Microsoft's attempts at the

Java language, see my review of Visual J++ 6.0 (APC June, page 40) or browse through the Java lobby's site (<http://javalobby.com/>).

Back to the issue at hand — you will also need a text editor to enter source code. It is important to note that you should save your text as plain text, with no additional formatting information. For Windows users, Wordpad or Notepad should suffice, or you can use EDIT in DOS. Whatever text editor you use, make sure that you save the file as plain ASCII text. Finally, you're going to have to read the documentation that comes with the virtual machine and development kit for the installation. There are too many different JVMs (Java Virtual Machines) and JDKs (Java development kits), running on too many different platforms for me to cover here. If you find that you're absolutely stuck, email me at trav@acp.com.au, and I'll try to help you get started. Be sure to include the platform you're on and which tools you're using.

A first look at Java

The initial stages of learning a programming language are always difficult, simply because there are many different concepts that must be presented at once. To reduce the number of new concepts that have to be learned, we're going to start at the very basics and look at programs that run from the command line. (OK, so if you're a Mac user, this is going to be a new concept, but you'll catch on quickly. The Mac development environment includes a command line simulator, so have a quick read through the documentation that came with your development environment.) Windows users will need to drop down to DOS. If you have a strong aversion to the command line, just remember: suffering builds character.

We'll start by presenting the familiar Hello World! example; you should enter in the code and save it in a text file named `hello.java`. Don't worry if it doesn't make sense at first — I'll explain the code later:

```
public class hello {
    public static void main (String
args[]) {
```

```
        System.out.println("Hello World!");
    }
}
```

Notice that the name of the class we are defining here is 'hello' (public class hello {}). For this code to compile, it must be saved in a file named after the public class defined in the code, `<class name>.java`. In this case, we must save the file as `hello.java`. I will discuss the difference between public and private classes later, but for now, it is enough to know that a public class is one which can be 'seen' from anywhere.

The next step is to compile the code. Assuming that you have properly set up your Java compiler, you should be able to type:

```
javac hello.java
```

at the command line. If you entered in the source correctly, the code should compile into bytecode. If you receive errors, dou-

represented as ones and zeroes). Writing a computer program using instructions that the computer understands — the ones and zeroes approach — is an extremely tedious, complicated and error-prone process. To facilitate the process, programming languages were developed.

A computer really only understand one language, its machine language. When we speak of computer languages, we are really talking about 'people languages'. When a programmer writes a program in the C language, it has to be translated into machine language. Translation is known as compiling a program. You can write the same program in any programming language, and the resulting machine code will be more or less the same, as long as it is being compiled for the same processor.

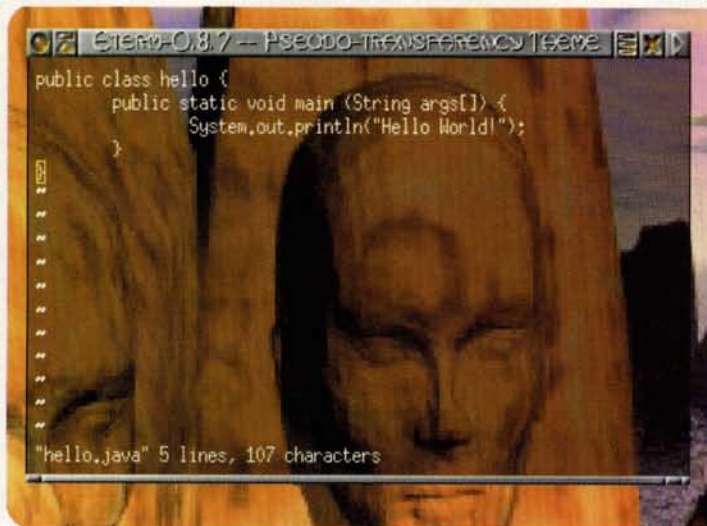
Java, however, is different. When the designers of the language were writing the specifications for the language, they invented an imaginary processor. They took into account all of the instructions that the processor would need to perform, and then wrote compilers to generate code for that processor. However, that processor doesn't actually exist (yet). Before a Java code can execute, it has to be translated from bytecode into the specific instructions for a certain computer architecture — and this is exactly what the Java Virtual Machine does.

To execute bytecode, you have to call the JVM, with the name of the class file as an argument. However, you should not include the '.class' suffix. For example, to execute our example code, type at the command line:

```
java hello
```

This command should execute the Virtual Machine, using the `hello.class` class file as the input. The output, as you might expect, is simply the 'Hello World!' message.

We've already run out of space for this month, but next time we'll start our exploration of Java programming and get our hands dirty with some code. Until then, feel free to email any questions or comments to me at trav@acp.com.au. Enjoy!■



ble-check that you've entered in the code exactly as it is listed above. If you receive an error about a PATH variable, refer back to the documentation that came with your development environment. If the compilation was successful, a new file named `hello.class` should have been created.

To understand what has happened, it will serve you well to look at the how a program is produced using the C language. Computer processors are driven by a set of predefined instructions describing a task that a computer can do. Each different processor has a different instruction set, but they are all a series of voltage inputs (traditionally

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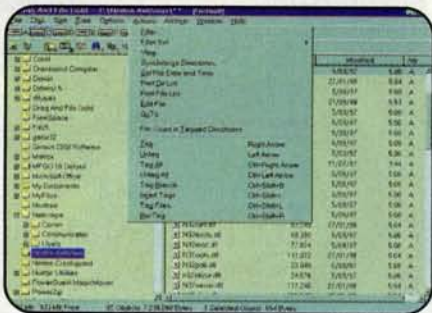
Each month this page lists all the Shareware files to be found on **apcmag.cd**. Simply browse to the Workshop section to find the files and related reviews.

Shareware summary

Windows 95

Drag and File Gold 4.71n

A powerful file manager with a built-in archive management and FTP client. Numerous enhancements make it a good replacement for Windows Explorer.



Virtual Drive 2.01

A CD-ROM drive emulator which stores and runs CD-ROMs as image files on the hard drive. Allows the creation of multiple virtual drives.

The TrialMagician 2.00

A utility which allows software to be installed in a protected environment which restores system contents and settings to their original state after the application has been tested.

File-Ex 98 2.12b

Enhancement to Windows 9x file open/save dialog boxes which adds file management commands, history lists and more. Can be trained to handle non-standard dialogs.

SiSoft Sandra 98 7.4.10

A powerful Windows 9x information/diagnostic utility which gives ready access to a wide range of system and performance data. Has useful report-generating functions.

OS/2

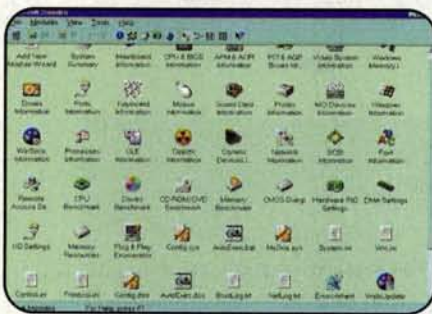
BanK 1.1.0b

BanK is a budgeting program using a simple PM interface to help you work out your finances.

Electronic Teller

If you need control over your finances, Electronic Teller is for you — it even

includes a built-in calculator and cheque printer.



In Control 1.60

A comprehensive suite of applications that will help you handle every conceivable area of your finances. You name it, In Control can do it.

PM Mortgage 1.10

Need to nut out the elements of a loan (mortgage or otherwise)? PM Mortgage can help by showing you a payment schedule to make everything easier.

Mac

Mt Everything 1.1.1

An all-in-one SCSI disk mounting utility which allows disks to be mounted and unmounted without rebooting. It also includes its own generic driver for use with Mac OS-unsupported drives and special functions for use with removable cartridge media.



Stripper 1.1

A risky little utility for stripping 68k or PowerPC code from fat binary applications. Don't mess with this unless you know what you are doing!

ZapResForks 1.0.1

Essential for Webmasters, ZapResForks removes the resource fork of any Mac OS file, allowing for smaller files to be transferred to users of any OS via 7-bit file space.

Frank's White Cells

More an assistant than an application, Frank's White Cells can take the hassle out of renaming large groups of files and adding standard suffixes for files shared with PC users.



Linux

tkWorld

A graphical extension to the shell that allows for flexible saving, loading and execution of commands. It's quite a brilliant idea, and should make Linux easier for new users while providing a useful script development facility for the more experienced.

OpenLDAP

A free implementation of the Lightweight Directory Access Protocol (LDAP) with servers, development libraries and client tools. It should be of great use to anyone implementing network-based directory services.

XNotesPlus

A handy reminder system for X, analogous to paper Post-It notes. Features include programmable alarms and integration with the PalmPilot.

GXedit

GXedit is an easy to use GTK+ based text editor with a good range of features, including spell checking and syntax colouring. Integrated news and email clients make it an ideal candidate for use in group projects. ■

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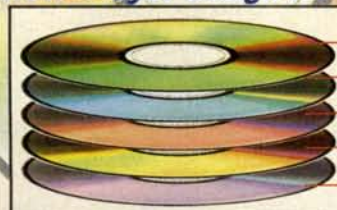
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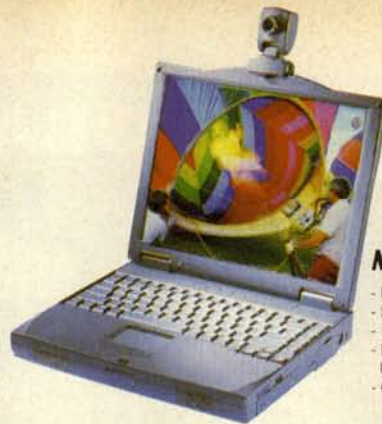
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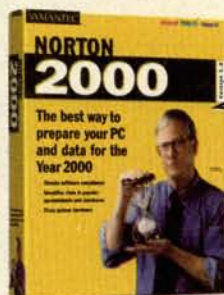
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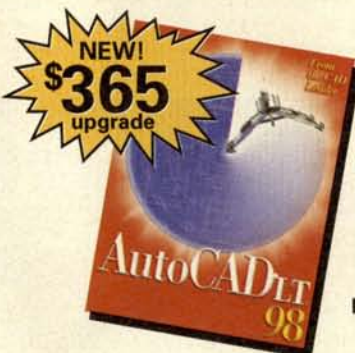


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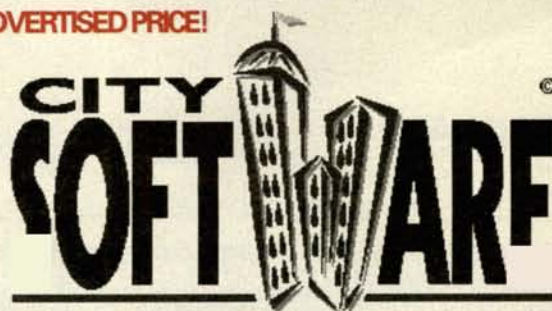


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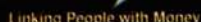
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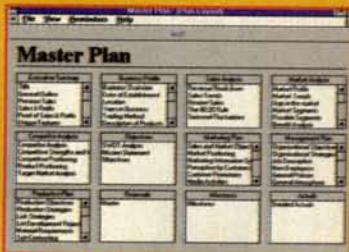
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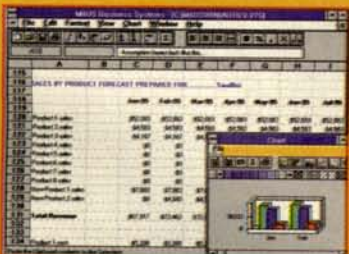


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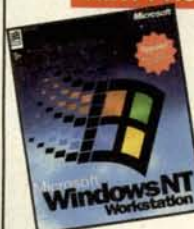
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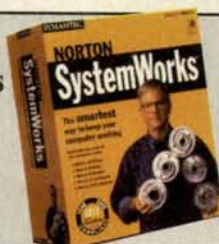


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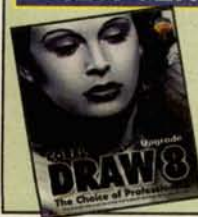
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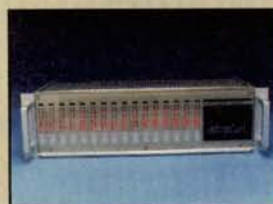
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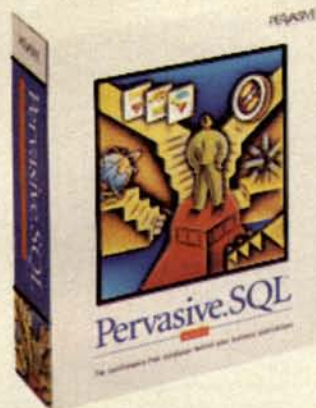
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 K2BK 6
 K2BK 6
 K3BK 6
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 K3BK 6
 K1BK 6
 K5BK 6
 K7BK 6 0
 K8BK 6
 K9BK 7
 K10BK 1 2
 K11BK 8
 K12BK 5 0
 K19BK 3
 K13BK 1 2
 K16BK 8
 K14BK 1 2
 K15BK 1 2
 K16BK 1 2
 K17BK 1 2
 K17BK 1 2
 K21BK 3
 K17BK 1 2
 K18BK 6
 K24BK 6
 K25BK 6
 K20BK 6

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REFILLS

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 K9CLR 1 2
 K10CLR 1 2
 K14CLR photo 1 2
 K11CLR 6
 K12CLR 6
 K22CLR 6
 K9CLR 1 2
 K12CLR 3
 K25CLR 6
 K1CLR 3 0
 K2CLR 1 2
 K23CLR 1 2
 K4CLR 4
 K3CLR 1 2
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 K5CLR 3 0
 K18CLR 6
 K21CLR 6
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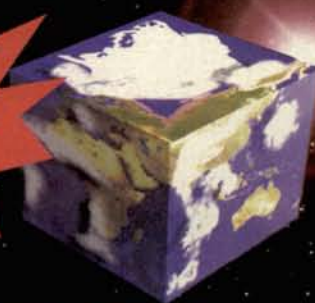
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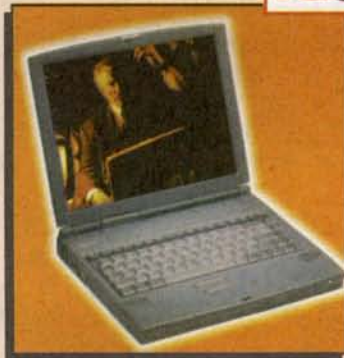
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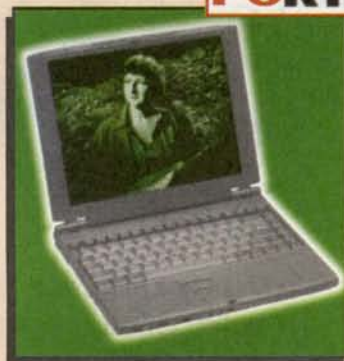


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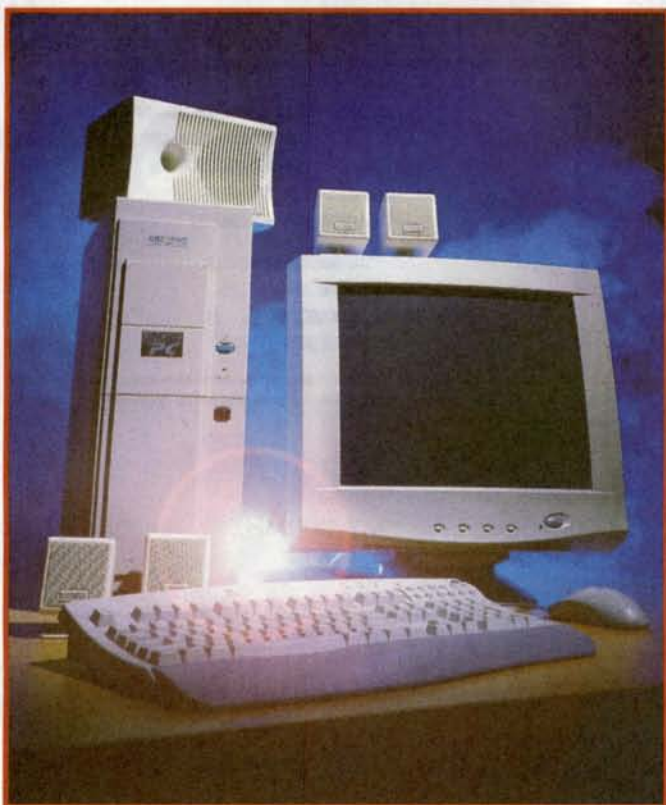
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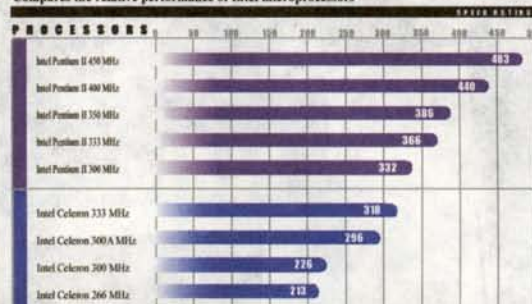
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Cyrrix

Code	Model	Price
CPIBM008	M2-300MHZ	\$199

Memory

SDRAM - For use in current Pentium / Pentium II systems utilising Intel TX / LX / BX Chipsets. 100MHz for Intel BX Chipsets. Use individually. All SDRAM is 168 Pin.

Code	Model	Price
RAGEN008	32MB SDRAM	\$75
RAGEN009	64MB SDRAM	\$185
RAGEN021	128MB SDRAM	\$365
RAGEN022	64MB 100MHz SDRAM	\$195
RAGEN023	128MB 100MHz SDRAM	\$375

* For use with Intel BX & Super Socket 7 Mainboards

EDO RAM - For use in newer 486 systems and most Pentium / Pentium Pro style systems. Used in pairs in Pentiums & Pentium Pro's.

Code	Model	Price
RAGEN004	8MB EDO SIMM 72 Pin	\$30
RAGEN005	16MB EDO SIMM 72 Pin	\$50
RAGEN006	32MB EDO SIMM 72 Pin	\$95

Fast Page RAM - For use in older 486 & Pentium systems and some printers. Use in pairs in Pentiums.

Code	Model	Price
RAGEN001	8MB SIMM 72 Pin	\$35
RAGEN002	16MB SIMM 72 Pin	\$55
RAGEN003	32MB SIMM 72 Pin	\$99

Parity RAM - This error checking ram is used with older desktop systems and servers.

Code	Model	Price
RAGEN011	4MB SIMM 72 Pin	\$35
RAGEN012	8MB SIMM 72 Pin	\$49
RAGEN013	16MB SIMM 72 Pin	\$59

Hard Disks

For details on Western Digital Hard Drives see page 8.

Quantum Fireball EL

Quantum is renowned for **quality** and **performance**. It has a fast average seek time - 9.5 milliseconds and internal data rates up to 158 megabyte per second at 5400 rpm. It also uses the Ultra ATA interface, with a data burst transfer rate of 33.3 megabytes per second.

IDE 3.5" - Fireball

Code	Model	GB	Cache	I/Face	Motor RPM	Price
HDQTM028	Fireball EL	5.1	512KB	UDMA	33MB/s	\$345
HDQTM029	Fireball EL	7.6	512KB	UDMA	33MB/s	\$495
HDQTM030	Fireball EL	10.2	128KB	UDMA	33MB/s	\$645

SCSI 3.5" - Fireball SE Ultra SCSI

Code	Model	GB	Cache	I/Face	Motor RPM	Price
HDQTM023	Fireball SE	3.2	512KB	Ultra	20MB/s	\$470
HDQTM024	Fireball SE	4.3	512KB	Ultra	20MB/s	\$575
HDQTM025	Fireball SE	6.4	512KB	Ultra	20MB/s	\$745
HDQTM026	Fireball SE	8.4	512KB	Ultra	20MB/s	\$945

IBM

IBM Ultra DMA33 - DESKSTAR HERCULES EIDE DRIVES

Code	Model	GB	Cache	I/Face	Motor RPM	Price
HDIBM006	DHEA 34331	4.3	512KB	UDMA	5400	\$359
HDIBM007	DHEA 36480	6.4	512KB	UDMA	5400	\$395
HDIBM008	DHEA 38451	8.4	512KB	UDMA	5400	\$505

IBM SCSI - ULTRASTAR 9ES DRACO SCSI DRIVES

Code	Model	GB	Cache	I/Face	Motor RPM	Price
HDIBM009	DDRS 34560-50	4.5	512KB	Ultra	7200	\$655
HDIBM010	DDRS 34560-68	4.5	512KB	U/W	7200	\$695
HDIBM011	DDRS 39130-50	9.1	512KB	Ultra	7200	\$1210
HDIBM012	DDRS 39130-68	9.1	512KB	U/W	7200	\$1265

MainBoards



DTK PENTIUM II/CELERON EX ATX MAINBOARD PRM-0082i

\$195

MBDTK010

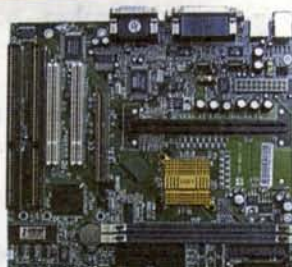
System Processor:

Pentium II/Celeron up to 333MHz
ACPI / Ultra DMA 33 / AGP port
Switching Voltage Regulator
Support 2 DIMM (3.3v) up to 512MB
2 PCI + 2 ISA + 1 AGP slot

ChipSet:

Intel 82440EX

On Board ESS 1938 32 bit Audio



DTK PENTIUM II BX ATX MAINBOARD PRM-00801

\$255

MBDTK008

System Processor:

Pentium II up to 450MHz
ACPI / Ultra DMA 33 / AGP port
Switching Voltage Regulator
Support 4 DIMM (3.3v) up to 512MB
4 PCI + 3 ISA + 1 AGP slot

ChipSet:

Intel 82440BX



MainBoards



\$275

MBCHA003



CHAINTECH 6BTM

System Processor:

- Supports up to 450MHz Intel Pentium II processors
- Slot 1 CPU socket with retention mechanism
- Supports 66/100MHz system clock speeds
- Innovative CPU technology (simple CPU installation via BIOS)

ChipSet:

- Intel 82440BX Chipset PCiset

AGP Graphics Port

Bios:

- Award System BIOS with PnP, APM, DMI, CPU throttling and Multi-device booting features

Ultra DMA-33 IDE Ports:

\$649

MBCHA004



CHAINTECH 6BDU

System Processor

Supports up to two

- 450MHz Intel Pentium® II processors
- Slot 1 CPU socket with retention mechanism
- Supports 66/100 MHz system clock speeds

ChipSet Intel 82440BX

two chip PCiset

Accelerated Graphics Port (AGP)

DRAM Memory

- Supports up to 512MB SDRAM
- Provides single-bit ECC capability

Two Ultra DMA-33 IDE Ports

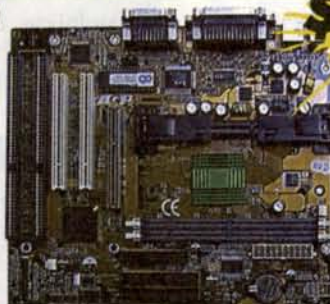
Ultra2 SCSI with RAIDport III On Board

- AIC 7880 SCSI controller and AIC-3860 chip, supports up to 80Mbps(Ultra2 SCSI)
- Supports Adaptec ARO-1130CA-C RAID card for RAID system upgradability

ATX Form

\$209

MBCHA005



CHAINTECH 6ESA

System Processor

Supports up to 333MHz Intel

- Pentium® II & Celeron® processors
- Slot 1 CPU socket with low cost retention mechanism
- Supports 60/66 MHz system clock speeds
- Innovative SEEU technology (simple CPU installation via BIOS)

ChipSet Intel 82440EX

two chip PCiset

Accelerated Graphics Port (AGP)

DRAM Memory

- Two 168-pin DIMM sockets support up to 256MB EDO and Synchronous DRAM
- Provides single-bit ECC capability

Two Ultra DMA-33 IDE Ports

Audio Subsystem

Micro-ATX Form

\$169

MBCHA006



CHAINTECH 5AGM2

System Processor

Supports up to 233MHz Pentium

- processors with MMX™ technology
- Supports Intel Pentium OverDrive processors (P54CTB)
- Supports 6x86MX and MII-300 processors
- Supports 166-350MHz K6™ and K6-2™ processors
- Supports 60/66/100 MHz system clock speeds

ChipSet VIA MVP3

(82C598AT/82C586) two

chip AGPset

Accelerated Graphics Port (AGP)

L2 Cache

• 512KB built-in Pipeline Burst SRAM

DRAM Memory

• Three 168-pin 3.3v unbuffered DIMM sockets

support up to 256MB PC66 & PC100 SDRAM

Compatible

Two Ultra DMA-33 IDE Ports

Two USB Ports On Board / FCC Class B & CE EMI Regulation Compliant

Sales staff are available (est) 9am-6pm Monday to Friday, 10am-4pm Saturday
Technical Support (5 Days a week 9am-6pm) Phone (02) 8344 3160

Sales Hotline 02 8344 3190



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Hard Drives



WD Caviar®

PHYSICAL SPECIFICATIONS

	Formatted Capacity	Model Number	
HDWES002	4.3 GB	WDAC24300	\$325
HDWES003	6.4 GB	WDAC36400	\$389
HDWES004	8.5 GB	WDAC38400	\$485
HDWES005	10.1 GB	WDAC310100	\$590

Average Read Seek	9.5 ms
Rotational Speed	5400 RPM
Buffer	256 KB

Western Digital's latest family of Caviar hard drives, and proven drive technology with an areal density of 2.875 GB per platter.

Using the industry-recognized 3.5-inch, low-profile WD Caviar design, these drives incorporate leading-edge magnetoresistive head technology to meet increasing capacity requirements. Read and write elements in the in the MR head are separate in order to optimize read and write capabilities. The read element, composed of a thin-film material whose resistance changes in the presence of a magnetic field, produces a strong signal allowing significant increases in areal densities.

These drives support Mode 4 PIO, Mode 2 DMA, and Ultra MB/5--double the current burst transfer rate. This results in maximum disk performance under PCI local bus environments.

- **MR Head Technology** - Magnetoresistive heads provide separate read and write elements, allowing optimization of the two functions for increased areal density and improved performance of the hard drive.

- **Ultra DMA/33 High-speed Host Transfers** - Doubles the current transfer rate under local bus environments.

- **S.M.A.R.T.™** - Assists the use in preventing possible system down time by warning users of the impending risk of data loss.

- **Exceptional Quality** - Guaranteed compatibility and automatic defect management allows easy installation. A three year warranty and 400,00 MTBF means years of trouble-free operation.



www.diamondmm.com.au



Sonic Impact S90

Hot 3D Wavetable Audio!

Diamond's Sonic Impact S90 uses advanced A3D technology to bring life-like positional 3D game play to your PC. Sonic Impact S90 includes hardware acceleration for 64 wavetable voices and Aureal's A3D to immerse you in the middle of the action. Add realistic atmospheric effects, including fog and underwater sounds, and you have total audio transformation for your PC.

- PCI design for faster system performance
- 64 Hardware wavetable voices
- Supports downloadable samples
- Runs with DOS, Win95/98, Win NT 4.0

MMDIA010 **\$110** RETAIL
MMDIA008 **\$79** OEM

Monster Fusion

2D & 3D Acceleration

Monster Fusion combines 16MB of 3D gaming power with fantastic 2D graphics acceleration, all in a single card. Diamond has built on 3Dfx's Voodoo Banshee technology to deliver 1920 X1440 resolutions and 60+ frames/second game play. Yes, it's Fusion Time, baby!

- Available in PCI and AGP configurations
- Supports Glide, Direct3D and OpenGL API's
- Explosive software bundle in special retail packs.



DCDIA019 **\$289** AGP OEM
DCDIA020 **\$310** AGP RETAIL
DCDIA021 **\$310** PCI RETAIL



Viper V550

The Viper V550 from Diamond features unprecedented 128-bit power for the state-of-the-art 2D graphics and stunning 3D quality for high-speed game play, business and professional graphics. Fully optimised for Windows 98, Viper V550 is the next generation in high performance graphics acceleration. Available in PCI and AGP 2X configurations

- Featuring 16MB of SDRAM
- 128-bit dual processor architecture
- Accelerates OpenGL and DirectX
- Supports software DVD

DCDIA016 **\$425** PCI
DCDIA018 **\$425** AGP

16MB

Monster Sound MX300

Ultimate 3D Audio Experience!!!

Want to annihilate your opponents every time? Diamond's Monster Sound MX300 gives you awesome combat tools: Aureal's latest A3D 2.0 positional audio, 4-speaker support and 64-voice hardware wavetable synthesis. Imagine playing your favourite PC game hearing footsteps from behind you and gun shots from overhead. Monster Sound MX300 delivers unbelievable 3D effects to give you the unfair advantage.



- Hardware A3D 2.0 acceleration
- 9.6 audio systems
- Features Dolby Digital (AC-3) support
- Advanced 320-voice wavetable with support for downloadable samples
- Supports DOS and Windows games

\$375
NMDIA011

Stealth II G460

8MB of AGP 2X Graphics Power

Let your PC show you brilliant colours and razor-sharp resolution. Stealth II G460 includes 8MB of SDRAM with AGP 2X power to make games and business applications come alive. Designed for use with Intel Pentium II processors.

- 8MB SDRAM
- Powerful 2D and 3D acceleration
- Supports Windows 95/98 and Windows NT 4.0



AGP Retail **\$275** DCDIA014
AGP OEM **\$175** DCDIA013

Micronics C400

The Ultimate Multimedia Platform



Diamond's Micronics C400 motherboard is the perfect platform for your ultimate multimedia system. Featuring Intel's 440BX AGPset, it supports Pentium II and Celeron processor up to 450MHz, Ultra DMA/33, USB, IR communications and advanced system monitoring features. For your totally accelerated PC, start with the best!

- 5 PCI slots (1 shared)
- Award BIOS on 1MB flash
- Legendary Micronics quality and performance

\$299
MBDIA000

HomeFree

Easy Wireless Networking!



No holes! No cables! HomeFree delivers 1MB wireless links for up to 16 PCs, 45 metres apart. Includes point-and-click network setup, software for shared Internet access, all at an incredible price. Windows 95/98 only.

- Frequency hopping for maximum security
- 45-metre range
- Each kit contains 2 nodes

Desktop to Desktop **\$449** NWDIA000
Desktop to Notebook **\$509** NWDIA001

Sales staff are available (est) 9am-6pm Monday to Friday, 10am-4pm Saturday
Technical Support (5 Days a week 9am-6pm) Phone (02) 8344 3160



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Sales Hotline 02 8344 3190

Wicked3D

WICKED3D

BOARD COMPANY

*The Ultimate in
Wicked3D Gaming!*

www.wicked3d.com

Wicked3D Vengeance

The Wicked3D Vengeance is a single-slot graphics card based on the 3dfx's Voodoo Banshee chipset that provides unmatched 2D and stunning 3D acceleration. It offers 128-bit 2D acceleration for incredible speed in 2D games and applications such as presentations, graphics manipulation and web browsing. The Wicked3D Vengeance provides superb 3D acceleration and complete compatibility with all your favorite Direct3D, QuakeGL, and 3Dfx Glide games.

Features:

- 16Mb of 100MHz 25ns SDRAM
- Higher resolutions than any other Voodoo Banshee card
- Unmatched 2D and stunning 3D acceleration
- Full frame rate DVD video acceleration
- Driver and performance optimization from the industry leader
- Exclusive stereoscopic eyewear support for over 160 games
- Full support for 3Dfx Glide, Direct3D and OpenGL Game

\$430

DCMIN000

Wicked3D Voodoo2

Fully loaded with 12MB of high-speed EDO DRAM, the Wicked3D featuring Voodoo2 uses Metabyte's software technology to give up to 40% better performance on Direct3D games than other Voodoo2-based graphics cards. The Re2Flex technology shatters any competitor's 800x600 (1024x768 SLI) barrier, by providing gaming resolutions up to 1024x672 or 1024x1024 in SLI! Wicked Vision drivers let you play over 160 games with the H3D Eyewear in stereoscopic 3D!

Features:

- Full 12 MB EDO DRAM
- 3Dfx Voodoo2 Chipset
- Complete 3D feature Set
- Awesome Metabyte Driver

\$470

DCMIN001

Wicked Vision

Take your game playing experience to new heights with the WickedVision H3D Eyewear System! When coupled with Wicked3D Voodoo2 or Banshee, the WickedVision H3D Eyewear System will let you experience truly immersive gaming with near universal 3D stereoscopic support. Over 160 of the latest games are supported including Quake2, Jedi Knight, Unreal, Need for Speed III and more.

Features:

- H3D wireless LCD shutter system
- Adjusts to fit most face sizes and over eyeglasses
- Up to 79Hz refresh rate per eye (158Hz total)
- Stereoscopic signal transmission up to 20 feet

\$320

IOMIN000



Video and Sound Cards **EAGLE**



Adelung Computers

EAGLE VOODOO II PCI GRAPHICS CARD

...for FOR THE ULTIMATE 2D/3D GAME EXPERIENCE!

- Features:**
- 12MB of high performance EDO RAM
 - Based on 3Dfx Voodoo2 chipset with dual texture engines
 - Full Direct3D hardware acceleration and compatible with 3Dfx Glide titles
 - SLI(Scan Line Interleave) connector and SVGA loopback cable included
 - Support any 2D graphics system through a video passthrough connector

12MB

\$315
DCEAG004

EAGLE i740 AGP VGA CARD

FOR BLISTERING PERFORMANCE AT AN AFFORDABLE PRICE!

- Features:**
- Using Intel 740 High Performance chipset
 - Full AGP 1.0 compliant and Full feature AGP 2x Implement
 - 3D Graphics Enhancements:
 - Support High-Quality MPEG1 and MPEG2 playback
 - Supports DirectX and OpenGL

DCEAG005 **\$99**

S3 Trio3D AGP VGA CARD

...for 3D graphic enhancement!

- Features:**
- Using S3 86C365 3D High Performance Chipset
 - High performance 3D graphics engine.
 - Drivers for all major operating systems

4MB

DCEAG006 **\$59**

DCEAG002 4MB 3D FX Voodoo 3D Accelerator **\$145**
DCEAG001 2MB S2 Virge 3D PCI VGA Card **\$53**

DCEAG001 4MB S2 Virge 3D PCI VGA Card **\$66**
MVEAG001 ES1938 (SOLO-1) PCI Sound Card **\$39**

Matrox Graphics

matrox

Productiva G100

Acceleration For Demanding Business Graphics

- 64-bit AGP graphics card
- 8MB of powerful graphics memory
- High performance 2D business productivity
- Support for 3D and video-based business applications
- OEM Pack

\$314
DCMAT023

Millennium G200

Extreme Games Acceleration At Unbelievable Frame Rates

- High speed 250MHz RAMDAC
- High quality 3D rendering engine
- High performance AGP 2X support
- MGA - G200 128 bit dual buff graphics chip
- 8mb SG Ram upgradeable to 16Mb

\$145
DCMAT025

Mystique G200

128 bit DualBus High Performance Gaming Engine with full AGP 2X support.

- 8MB of graphics memory upgradeable to 16MB
- High Quality 3D rendering engine delivers blistering gaming performance.
- High octane video - engine for Mpeg1 and Mpeg2 video acceleration.

\$314
DCMAT027

Superior Acceleration For Professional 2D/3D Graphics

Marvel G200

Blazing Fast 2D & 3D Graphics

- Award winning G200 chipset
- 128-bit Dualbus graphics
- Full AGP 2x or PCI
- Fast 230MHz RAMDAC
- 8MB SDRAM memory, upgradeable to 16MB
- PC to TV & Video Output & Frame Capture
- Displays 3D games and DVD video on your TV

- Captures high quality video images or clips from a TV, VCR or Video
- Camera to your Hard Disk
- Record video back to VHS tape
- Software Titles
- Ulead Media Studio 5.0VE
- Avid Cinema
- Photo Express V2
- Tonic Trouble

\$525
DCMAT029

Sales staff are available (est) 9am-6pm Monday to Friday, 10am-4pm Saturday
Technical Support (5 Days a week 9am-6pm) Phone (02) 8344 3160



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Righteous 3D

Whether you're into serious flight sims or hard core mutant blasting, brace yourself for arcade action with Righteous 3D. Based on 3Dfx Interactive Voodoo Graphics, Righteous 3D delivers some of the same 3D capabilities found in arcade systems.



\$215
MMORC00

Orchid

NuSound 3D

The Ultimate in digital sound for Realistic 3D gaming!

Features:

Aureal 3D audio that creates highly realistic and immersive 3D sounds the way they are in the real world. It will convince you that **sounds are above, behind and all around you.**

Advanced Features:

- Aureal Vortex AU8820 digital audio processor
- PCI BUS master with 18-channel DMA Interface
- Professional studio quality 64-voice wavetable synthesis



\$110
MMORC02

Righteous 3D II 12MB

High performance VOODOO 2 3D accelerator!

Righteous 3D II is a dedicated 3D accelerator that delivers arcade quality 3D graphics acceleration. It has full motion frame rate performance with all 3D features simultaneously accelerated. 12MB EDO DRAM configuration with triple 64-bit memory architecture. Righteous 3D II is a dedicated 3D accelerator that works transparently with your 2D adaptor to render complex three dimensional environments in real-time.



\$375
MMORC01 (12MB)

WinCast TV Tuner

WinCast/TV

WinCast/TV is a single slot PCI card which has a 125-channel cable-ready TV tuner and a video digitizer.



With WinCast/TV you can:

- watch TV on your VGA screen in a resizable window
- input from your VCR or Cam Corder
- snap still video images
- grab motion video movies
- videos conference with PC video conferencing software like NetMeeting, CU-SeeMe, IPPhone, VDOphone and more!

**Plug-and-Play
Installation**

WinCast/TV's motion video capture will make digital video movies on your PC's hard disk.

Capture professional quality 24-bit video images with 4:2:2 digitizing.

Live TV-in-a-window on VGA monitors from 640x480 to 1280x1024 in up to 16 million colours.

Create high impact presentations with 320x240 AVI clip capture with real time preview.

\$265
MMHAU000

Jazz Speakers



Adelong Computers

FREE
SOFTWARE WITH
ALL SPEAKERS
SOLD.
1 WEB 3D
2 MULTIMEDIA
CREATIVE SUITE

JS-100 128W
\$75 MMJAZ001



JS-200 200W
\$85 MMJAZ002



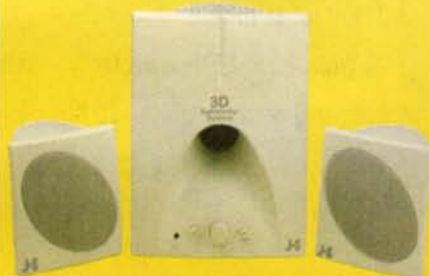
JS-300 450W
\$99 MMJAZ003

Adjustable 3D Sound
The JS-200 & 300 offer customised
3D sound control not found on
any other multimedia speaker.



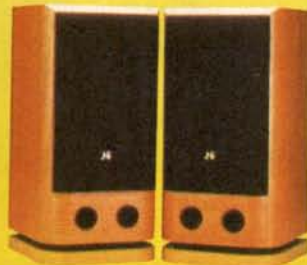
J-7901 MMJAZ029 **\$115**

- 21 Watts RMS total system power
- 3D sound enhancement



J-707 MMJAZ028 **\$170**

- 28 Watts RMS total power
- 4" woofer • 2" tweeter
- 75-20,000Hz freq. response



J-2106
MMJAZ030
\$29

- 2 Watts RMS total power
- 3" full range driver
- Magnetically shielded



J-904 200W
\$75
MMJAZ025



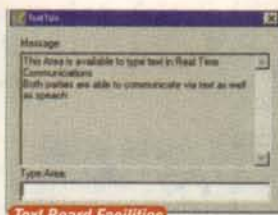
INTERNET

Mate™

Business and home users with
Internet access can now cut
hundreds of dollars off their
phone bills with the InternetMate



Video Capture Facilities
Face to face video
conferencing while you
talk, as well as Video
Capture facilities.



Text Board Facilities
Use the Text board Facilities for
real time text talk for failsafe
operation.

Minimum System Requirements

PC Users

Pentium 90MHz or faster processor
16Mb RAM or greater
Internet Connection
Full Duplex Soundcard
14.4Kbps Modem or greater

\$45
JOINT000

Xmas Special!

With the supplied Handset and GatherTalk
software, you can talk with anyone in
the world via the Internet for the cost of a
local call (plus ISP rates).

Unlike other Internet telephony,
InternetMate offers full-duplex operation.
This means that users with a full duplex
sound card installed on their computers can
have a natural "real time" conversation. The
only requirement is that both parties have
the InternetMate installed.

Sales staff are available (est) 9am-6pm Monday to Friday, 10am-4pm Saturday
Technical Support (5 Days a week 9am-6pm) Phone (02) 8344 3160



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**ALTEC
LANSING**

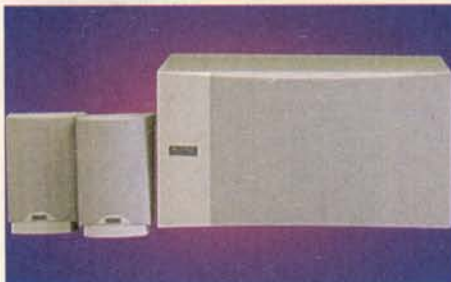
Altec Lansing

**PC
MAGAZINE
AUSTRALIA
EDITORS
CHOICE**

January 1998

ACS48 PowerCube Plus Speaker System

The PowerCube Speaker System, from Altec Lansing is the market's leading affordable audiophile multimedia audio solution for the home or office. Comprising of a 3 unit system, allows you to experience hi-fi quality audio from your CDs, games or the Internet. In addition, the Powercube Plus 6" subwoofer is encased in wood, offering you a deeper low frequency response.



- 20 Watts RMS Satellite Speakers
- 3" full range driver
- 3/4" high frequency driver
- 40 Watts RMS, 6" subwoofer
- frequency response 35Hz - 20 KHz

\$269
MMALT003

ACS45 PowerCube Speaker System

Introducing the Altec Lansing ACS45 PowerCube Speakers, a three piece multimedia audio solution at an unbelievable price. Experience the enhanced output of the PowerCube satellite system. Great for games and CD's, the ACS45 will bring hi-fi audio to your computer desktop today.

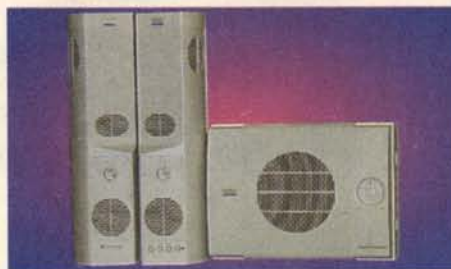


- 6 Watts RMS Satellite Speakers
- 3" full range driver
- 20 Watts RMS, 4.5" subwoofer
- frequency response 35Hz - 20 KHz

\$159
MMALT001

ACS500 Surround Sound Speaker System

This superb three piece system delivers five channels of surround sound featuring Dolby Pro-Logic for Multidimensional excitement. The Satellite tower speakers deliver direct stereo imaging for hi-fi audiophile sound whilst giving the option for center and surround channel effects & sounds.



- 22.5 Watts RMS Satellite Speakers
- 2 x 3" full midrange driver
- 1/2" dome tweeter
- 40 Watts RMS, 6.5" subwoofer
- frequency response 35Hz - 20 KHz

\$450
MMALT004

ACS55 Power Gaming Speaker System

A Three-piece speaker system that delivers the realistic sound demands of today's games. Combining a powerful 40Watt subwoofer and a unique satellite speaker which incorporates direct stereo imaging through center and surround channels. In addition the ACS55 features Dolby (r) Multimedia Surround Sound for Multidimensional Effects.



- 12 Watts RMS Satellite Speakers
- 3" full range driver
- 1/2" dome tweeter
- 40 Watts RMS, 6.5" subwoofer
- frequency response 35Hz - 20 KHz

\$259
MMALT002

ACS91 Altec Lansing

The ACS91 PowerCube speaker system delivers powerful audio output to suit the home or office computer. Maintaining the tradition of audio quality synonymous with Altec Lansing these speakers are now available at an unbelievable price.



- 5 Watts RMS Satellite Speakers
- 3" full range driver
- frequency response 90Hz - 20 KHz

\$55
MMALT000

Umax Scanners

UMAX



Adelong Computers

Astra 1220 series - Includes Adobe PhotoDeluxe

The Affordable 36 bit professional scanning solution



The Astra 1220 series was designed specifically for corporate or small office users who want something more from their scanner. Built with a 36 bit colour CCD, the Astra 1220 captures an amazing 68.7 billion colours to bring all your images to life. A complete range of easy to use software is included with the 1220, making it a versatile tool for any user. Perform OCR with astonishing accuracy or scan images to add a splash of colour to your documents. The opportunities are endless with the UMAX Astra 1220.

- 1200 x 600dpi optical resolution for crisp, vibrant images
- 9600dpi max. resolution for smooth lineart & image magnification
- A 36 bit colour depth captures 68.7 billion colours
- A4 scanning area (216 x 297mm)
- Single pass colour CCD for fast, productive scanning

1220S **\$695** IOUMA005 **SCSI**

1220U **\$695** IOUMA006 **USB**

1220P **\$335** IOUMA00 **PARALLEL**

Astra 610 series

The compact plug 'n' play colour scanner for home and office users

Add the colour and vitality of images to everything you do on your computer with a new Astra 610 series scanner. After plugging it in and installing the software, simply press the 'on' button at the front of the scanner and you're ready to go - it's that easy!

- 600 x 300dpi optical resolution for crisp, vibrant images
- 4800dpi max. resolution for smooth lineart & image magnification
- Captures over 1 billion colours through 30 bit scanning

- A4 scanning area (216 x 297mm)
- Single pass colour CCD for fast, productive scanning
- Extensive software package handles all your creative and scanning needs

610P **\$195** IOUMA002 **PARALLEL**

610S **\$390** IOUMA003 **SCSI**



SCSI Interface Included

OmniPage Training

OMNIPAGE PRO TRAINING CD

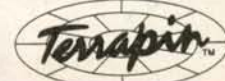
- Boost your skills by 200%
- Unleash the true power of Omnipage OCR software
- Simple & true saving interactive tutorial

SWLEA000 **\$59**



LIFETIME WARRANTY

Terrapin



The natural selection.



Terrapin Hardshell Officestation, ideal for notebook, documents, accessories. Complete protection for your notebook

MSTER001 **\$125**



Terrapin Lether Officestation, ideal for notebook, documents and accessories

MSTER002 **\$160**



Terrapin SoftShell Workstation, ideal for notebooks, documents and accessories....

MSTER000 **\$50**

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Technical Support (5 Days a week 9am-6pm) Phone (02) 8344 3160



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Sales Hotline 02 8344 3190

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Input & Output Devices

Keyboard

Code	Model	Price
IOGEN000	ENHANCED 104/WIN95	\$25
IOGEN001	HONEYWELL GENUINE - 104/WIN95	\$45
IOGEN010	GENERIC PS/2 Keyboard	\$35

Mice

IOGEN003	SERIAL MOUSE	\$15
IOGEN004	PS/2 MOUSE	\$19

Joystick



new

Microsoft Sidewinder Force Feedback Wheel puts you in the race like never before. To feel every bump, vibration, and g-force pull in any Microsoft DirectX 5.0/6.0 - compatible game supporting force feedback technology.

IOMST011 **\$345**



With digital optical technology & improved ergonomics, the Microsoft Sidewinder Precision Pro 2.0 adds comfort to the joystick grip, the throttle, overall button layout and design.

IOMST005 **\$118**

Mouse

Microsoft Wheel Mouse 1.0

Microsoft Wheel Mouse provides easy set-up and use, a convenient wheel for scrolling, and reliability - it's the easy mouse choice for the home or office.

IOMST009 **\$39**

Microsoft IntelliMouse 3.0

Microsoft IntelliMouse helps you to work more efficiently by letting you scroll and zoom in compatible applications with an easy-to-use wheel.

IOMST003 **\$87**

Microsoft IntelliMouse Pro 1.0

Microsoft IntelliMouse Pro incorporates a new level of comfort and efficiency with its innovative design and advance zooming and scrolling capabilities.

IOMST010 **\$105**

Adaptec SCSI Cards (OEM)

Code	Model	Tfr Rate	Price
CCGEN001	AHA-1520 ISA	10 Mbs	\$150
CCGEN003	AHA-2940U	20 Mbs	\$349
CCGEN005	AHA-2940UW	40 Mbs	\$395

Controller Cards

Code	Model	Price
CCGEN000	ISA MULTI I/O	\$35
CCGEN015	ISA PRINT CARD	\$20

HP Scanners

SWLEA000

\$59



OMNIPAGE PRO TRAINING CD

HP ScanJet 4100C

If you need an easy scanning solution, try the HP ScanJet 4100C. Everything you need for unmatched ease and convenience is right in the box, including software to scan, store or print. Setup is simple with the Universal Serial Bus (USB). Step-by-step instructions are quick and easy. One simple viewscreen guides you through a variety of great possibilities - from sending a picture to a client through the Internet to copying a presentation in full color on your color printer.



IOHPD017 **\$345**

HP ScanJet 6200C

Productivity means completing your task quickly - with the quality you need. With the HP ScanJet 6200C Professional Series color scanner, you can be up to 4 times more productive than with comparable scanners. Simply push the scan button, select the element you want in the preview screen, drag and drop it into your favorite application. You've got the control to make adjustments when you want or let the scanner do it for you.



IOHPD017 **\$755**

Code	Model	Price
IOHPD018	6200 & Adobe Photoshop 4.0	\$969
IOHPD019	6200 & OmniPage Pro 8	\$975

HP ScanJet 5100C

The HP ScanJet 5100C color scanner has the power to make home and office productivity skyrocket. Plus, breakthrough HP technologies act as a built-in expert for great results the first time and every time you scan. In just one step, photos are optimized, black-and-white line art and logos can be scaled infinitely, and text is captured accurately, ready for editing. Setting up your HP ScanJet 5100 scanner is almost as easy as using it. Connect it via your parallel port, just like a printer.



IOHPD001 **\$475**

HP ScanJet 6250C

For the best image quality and maximum productivity for professionals look no further than the HP ScanJet 6250. With a 1200DPI optical resolution and virtually unlimited enhanced resolution, the HP 6250 is networkable for sharing over a LAN. A 25 sheet feeder is also featured for high workgroup productivity. USB & SCSI capable.



IOHPD014 **\$990**

Code	Model	Price
IOHPD015	6250 & Adobe Photoshop 4.0	\$1195
IOHPD016	6250 & OmniPage Pro 8	\$1200

Monitors

Panasonic

Panasonic's NEW Digital technology sets the standards for Top performing high-end monitors. All monitors feature true-type colours, excellent focus and convergence, power saving functions and crystal clarity in colour display.

PanaFlat LC50

15" colour monitor with state-of-the-art design creating a slim profile.

Specifications

- 15" flat screen monitor
- 0.297mm dot pitch
- Built in Multimedia Speakers
- On-Screen display controls
- 1024x768 max.res.
- 15" viewable area

\$2375 MOPAN013



PanaSync™ E50i

Excellent Value Multi-Scan Display with Higher Picture Quality and Convenience.

Specifications

- 15" diagonal flat screen
- 0.28mm dot pitch
- Anti-static, Anti-glare coating
- 1024x768 max.res.
- 14" viewable area

\$360 MOPAN008



PanaSync SL70

17" Digital Multiscan colour FST display. The monitor that's very sharp and compact in size.

Specifications

- 17" flat screen monitor
- 0.25mm dot pitch
- Advanced anti-glare, anti-static coating
- On-Screen display controls
- 1600x1200 max.res.
- 16" viewable area

\$795 MOPAN003



PanaSync E70

Energy-Saving 17" Display with Automatic frequency selection from 30K - 70kHz.

Specifications

- 17" flat screen monitor
- 0.27mm dot pitch
- Anti-glare, anti-static coating
- On-Screen display controls
- 1280x1024 max.res.
- 16" viewable area

\$675 MOPAN010

PanaSync SL90

19" monitor with a large 18" true viewable area. Super sharp and compact in size.

Specifications

- 19" flat screen monitor
- 0.25mm dot pitch
- Advanced anti-glare, anti-static coating
- On-Screen display controls
- 1600x1200 max.res.
- 18" viewable area

\$1445 MOPAN011



PanaSync S110

The 21" monitor that takes brightness to a new level and places its focus on high image quality.

Specifications

- 21" flat screen monitor
- 0.25mm dot pitch
- Anti-glare, anti-static coating
- On-Screen display controls
- 1600x1200 max.res.
- 20" viewable area

\$2149 MOPAN001

Storage Devices

Panasonic

LS 120 120MB LKM-F434-1

- Large storage cap. of 120MB in a single LS-120 diskette
- 100% compat. with existing 3.5" diskette media
- Supported by MS DOS, Windows (3X, 95, NT)
- Bootable with BIOS



BUPAN000 **\$175**

Panasonic DVD Kit

DVD technology brings a whopping 8 GB of data per disk to your desktop today. Watch the latest DVD titles or play the latest multimedia and games with the Panasonic DVD kit.

new



MMPAN006 **\$375** (DVD Drive & MPEG Decoder)

MMPAN005 **\$295** (DVD DRIVE)

CD Recordable (4Wx8R) CW-7502-BAB

CD-Recordable Drive Kit, 4-speed write/8-speed read bundles with software & SCSI interface



MMPAN003 **\$720** (OEM KIT)

MMPAN004 **\$570** (BARE DRIVE)

ZIP Drive JU-811T01

- 100Mb Capacity (70 FDDs)
- Use with 100MB Zip Disk



BUPAN001 **\$165**

CD ROM 32X CR-588-B

Superfast 32x speed reading, this can also read CDRW disc.



MMPAN002 **\$125**

CD ROM SCSI 24X CR-508-BPA

Panasonic CD508B SCSI 2 CD-Rom drive is one of the best performing drives available. Super fast access time of 85ms and 3600KB/s sustained transfer rate.



MMPAN001 **\$170**

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EXCELLENCE THROUGH INNOVATION

3 YEAR ON SITE WARRANTY*



**Mitsubishi
Diamond View
1554 15"**
\$355
MOMIT003

Advanced Plug & Play

Superior image
fidelity 0.28DP

Maximum Resolution
1024x768 up to 72Hz

13.6" True viewable



**Mitsubishi
Diamond View
1772E 17"**
\$625
MOMIT002

Advanced PnP compatibility

Superior image
fidelity 0.27DP

Freq H: 30-72KHz
Freq V: 50-120Hz

Maximum Resolution:
1280x1024 up to 60Hz

16.0" True Viewable



**pc world
BEST BUY**

**Mitsubishi
Diamond Plus
71 17"**
\$965
MOMIT001

DIAMONDTRON Monitor,
with the super-fine aperture
grille pitch of 0.25mm

Maximum Resolution
1280x1024 up to 65Hz

16.0" True viewable



**Mitsubishi
Diamond Pro
91TXM 21"**
\$2999
MOMIT000

A new DIAMONDTRON Monitor,
with the super-fine aperture grille
pitch of 0.28mm

Maximum Resolution
1280x1024

19.7" True viewable

Storage

The new standard
in diskette storage.

Code Model
BUMIT000 Mitsubishi LS - 120 - 120MB Capacity.

Mitsubishi LS-120 FACTS:

- Large storage capacity of 120MB in a single LS-120 diskette.
- 100% compatibility with existing 3.5" diskette media
- Supported by MS DOS, Windows (3X, 95, NT)
- Bootable, can act as a Boot Drive when appropriate BIOS installed

BUMIT001 120MB capacity diskettes to suit LS - 120 Drive **\$25**

Code	Model	Price
FDMIT000	Mitsubishi Diamond Data 1.44MB Floppy disk drive.	\$36
MMMIT002	6x2 CD Rewriter 6206D IDE KIT + SW + CD	\$650
FMMIT000	Diamond Voice V.90 56K Internal Modem	\$140
FMMIT001	Diamond Voice V.90 56K External Modem	\$150

Code	Model	new Price
MMMIT003	Mitsubishi Diamond Data 36X CD-ROM	\$110
MMMIT001	Mitsubishi Diamond Data 32X CD-ROM	\$99



new

**Mitsubishi
15" LCD TFT**
\$2250
MOMIT004

15" LCD TFT Monitor with
the grille pitch of 0.28mm

Maximum Resolution
1024x768



Keyboards

**Mitsubishi Diamond Touch
Ergonomic Keyboard**
\$49 IOMIT001

**Mitsubishi Diamond Touch
Economical Keyboard**
\$30 IOMIT000



Monitors & Projector



Adelong Computers

THREE YEAR on-site warranty!



Full featured professionals 17" (15.7 viewable), full square high resolution flat face colour monitor with 0.28 dot pitch.

Specifications:

- Easy to use
- Fully supports Windows 95
- Resolution of 1280 x 1024 at 60Hz(N/I)
- Bandwidth (-3dB) 110MHz
- Microprocessor
- Plug & Play
- Display area of 320 x 240mm
- User control with Power Switch, Reset, Manual Degaussing, Contrast & Brightness
- Power saving (DPMS)
- Standard EMI, Safety, Ergonomics & low rad.

Hansol 701A

\$675 MOHAN004



Full featured professionals 17" (15.7 viewable), full square high resolution flat face colour monitor with 0.26 dot pitch.

Specifications:

- Easy to use
- Fully supports Windows 95
- Resolution of 1600 x 1200 at 66.6Hz(N/I)
- Bandwidth (-3dB) 135MHz
- Microprocessor
- Plug & Play
- Display area of 320 x 240mm
- User control with Power Switch, Reset, Manual Degaussing, Contrast & Brightness, H/V size, Tilt, Colour control
- Power saving (DPMS)
- Standard EMI, Safety, Ergonomics & low rad.

Hansol 700P

\$775 MOHAN005



Hansol 500A

15" Diagonal colour monitor 280 x 210mm with 0.28 dot pitch.

Specifications:

- Easy to use
- Fully supports Windows 95
- Display area of 280 x 210mm
- Ergonomics and low radiation
- Resolution of 1024 x 768-60Hz
- Standard EMI, Safety,
- Bandwidth 65MHz
- Microprocessor
- Plug & Play

\$355 MOHAN001



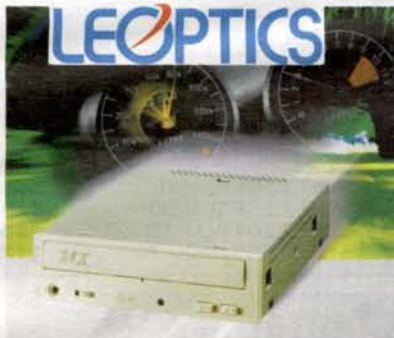
Hansol 500M

15" Diagonal colour monitor 280 x 210mm with 0.28 dot pitch.

Specifications:

- Easy to use
- Fully supports Windows 95
- Display area of 280 x 210mm
- Ergonomics and low radiation
- Resolution of 1024 x 768-60Hz
- Standard EMI, Safety,
- Bandwidth 65MHz
- Microprocessor
- Plug & Play

\$375 MOHAN003



32X CD-ROM Drive

- Intelligent latest advanced technology
- Has a good suspension for vibration control
- Front panel with a direct Audio CD play function button
- High data transfer rate-- 4800 KB/Sec.
- Data access speed is powerful-- 100 msec.

\$89 MMLEO001

CD-Recordable/Re-Writable Multi-function Disc Drive

- Unique multi-function concept combining 6x CD-ROM reader, 2x CD-Rewritable drive
- IDE/ATAPI interface - no need for costly SCSI adaptors
- Supports TAO (Track At Once), DAO (Disc At Once), MS (Multi-Session), fixed and variable (Incremental Packet) writing modes, as well as CD-DA, CD-ROM (XA), CD-Bridge, Multi-Session, CD-I, Video-CD and CD-UDF disc formats

\$570 MMLEO002

CTX



The EzPro series are the outstanding personal projectors for professionals who take to road for professionals who take to the road for multimedia presentation.

EzPro 500

- 6.4" colour TFT LCD Panel
- 16.7" million colours
- 350 ANSI lumens
- 640 x 480
- 400 Watt lamp
- Speaker

\$3575 MMCTX000

EzPro 550

- 800 x 600 Resolution

\$5195 MMCTX001

EzPro 680

- Portable projector, only 5.5kg
- 1024 x 768 resolution
- 500 ANSI lumens

\$10525 MMCTX002

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SparQ 1.0GB Drive

'The personal solution'.

A superb combination of high performance at an affordable price. Easily backup your laptop or desktop system in minutes. **SparQ** gives you the bandwidth you need for show-stopping multimedia presentations and archive your Internet downloads. Play your favourite games off a **SparQ** cartridge at twice the speed of a CD. Backup your computer in minutes. Transfer files, applications and operating systems from home to office for extreme flexibility and multitasking.



- Features:**
- 1.0 GB Capacity
 - Buffer/Cache: 512 KBytes
 - High Performance Hard Drive

- Bonus Software Incl:**
- Seagasoft Heat Net
 - Novastor Novadisk SE
 - Serif Drawplus 3.0 SE
 - Netresults WEBVCR
 - Alta Vista Howdy
 - SPRYNET
 - Mcafee Webscan

\$475

Code	Model	Price
BUSYQ004	SPARQ 1.0GB EIDE INT	\$475
BUSYQ005	SPARQ 1.0GB PARALLEL EXT	\$475
BUSYQ009	SPARQ 1.0GB MEDIA PC	\$89

SyJet 1.5GB Drive

'The personal solution'.

Award-winning high performance removable cartridge hard drive. Enough capacity to hold over 1,000 floppies on a 3oz. cartridge. The logical choice for professional musicians, audio mixers, digital video editors, graphic designers, webmasters, desktop publishers and game players. Fast enough to store, edit and run full-motion video. Holds more than 80 minutes of broadcast quality video. Record, edit and run your audio compositions for seamless playback. Holds over 2 hours of CD-quality audio. Create animation, audio and video sequences for multimedia presentations. Run directly off a **SyJet** cartridge. Work directly from **SyJet** and minimise clutter on your internal drives.



- Features:**
- 1.5 GB Capacity
 - Buffer/Cache: 512 KBytes
 - High Performance Hard Drive
 - Ground breaking technology
 - Portable drive/light weight
 - High speed, high volume

\$680

Code	Model	Price
BUSYQ000	SYJET 1.5GB IDE INT	\$680
BUSYQ001	SYJET 1.5GB SCSI EXT	\$680
BUSYQ003	SYJET 1.5GB PARALLEL EXT	\$680
BUSYQ008	SYJET 1.5GB MEDIA PC	\$175

EZFlyer™ 230 Drive

The **EZFlyer™ 230** combines the flexibility of a data cartridge with the speed of hard drive technology. Easy-to-use, small and lightweight, the drive can be carried around in your pocket. The **EZFlyer™ 230** provides more space just by adding more cartridges. Carry large graphics files in the palm of your hand. Excellent storage device for desktop publishing, pre-press, Internet, photography, multimedia, imaging, video, audio and back-ups. The **EZFlyer™ 230** features external SCSI and Parallel Port.



- Features:**
- 230 MB Cap., Int.EIDE
 - 13.5 msec average seek time
 - External SCSI & Parallel Port
 - Superior HD performance
 - Small and lightweight
 - Auto eject button

\$375

Code	Model	Price
BUSYQ006	EZFLYER 230MB SCSI EXT	\$375
BUSYQ007	EZFLYER 230MB PARALLEL EXT	\$375
BUSYQ010	EZFLYER 230MB MEDIA PC	\$65

State-of-the-art technology for MAC & PC file storage!

lomega



Adelong Computers

Jaz 2 Drive

Want portability and blistering speed?

The new format Jaz disks hold up to 2GB of data each. Jaz 2GB drives are 100% compatible with 1GB disks. Works with both MACs and PCs via an external SCSI interface.

JAZ 2GB DRIVE
(SCSI EXT.)
\$829
BUIOM018

JAZ 2GB DRIVE
(SCSI INT.)
\$825
BUIOM017



lomega Buz

All the hardware and software you need to be a video genius

Introducing the lomega Buz - the easiest way to get multimedia from camcorders, DVD, CD-Roms, VCRs and laserdiscs into your PC! It's a video capture and editing board combined with an Ultra SCSI controller that lets you:

- Capture Multimedia (fullmotion) video, sounds, digital pictures, music) into a PC
- Edit it using the easiest software around



\$369
BUIOM023

Apple Mac
\$565
BUIOM027
Available in Mac format



Media Accessories



Code	Model	Price	Code	Model	Price
BUIOM012	100MB PC ZIP DISKS (1 PER PACK)	\$25	BUIOM020	JAZ MEDIA 1GB PC DISK (1 PER PACK)	\$175
BUIOM005	100MB PC ZIP DISKS (3 PER PACK)	\$72	BUIOM008	JAZ MEDIA 1GB PC DISKS (3 PER PACK)	\$530
BUIOM006	100MB PC ZIP DISKS (10 PER PACK)	\$210	BUIOM024	JAZ MEDIA 2GB PC DISK (1 PER PACK)	\$200
BUIOM014	ZIP DRIVE CARRY CASE	\$59	BUIOM025	JAZ MEDIA 2GB PC DISKS (3 PER PACK)	\$585



Zip Drive

Expand your hard drive without limits

Heading Increase your storage quickly, easily and economically - as you need it. With 100MB Zip disks you can add as many disks as you need. Available in three types. Parallel / SCSI Mode / ATAPI



ZIP DRIVE
PARALLEL
\$255
BUIOM000

ZIP DRIVE SCSI
\$255
BUIOM001

COMING
SOON USB
ZIP

Retail ATAPI
100MB ZIP ATAPI
\$225
BUIOM028

100MB ZIP
ATAPI OEM
\$175
BUIOM007



\$215
BUIOM022

Zip Card

PCMCIA to SCSI adapter. Zip card is a PCMCIA to SCSI adapter card that, when connected to your notebook computer and a SCSI Zip Drive, allows you to get 2-5 times the performance over a parallel port Zip Model.

...the fastest and most convenient way to run a zip drive on your notebook

Jaz Traveller

Portability Solution...

Jaz Traveller is a SCSI to parallel port converter for the Jaz drive. The Jaz Traveller allows you to connect an external Jaz drive to the parallel port on the IBM-compatible computers.



\$95
BUIOM013

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NetComm

Modems

Netcomm Roadstar II

Supporting both 56K Flex & V.90 standards, Australia's best selling modem, the Netcomm Roadstar II will let you surf the Internet at today's fastest speeds.

- SVD Technology allows you to talk whilst sending data simultaneously
- Full voice capabilities with voicemail. Headset included
- Full version of WinFax Pro 8

FMNET012 **\$265**FMNET015 **\$285**

USB



Banksia Wave SP 56Kflex V.90

The Wave SP 56 supports both V.90 and K56flex standards to ensure you have no disruptions to your 56K modem connections. A smart answerphone facility provides multiple mailboxes for up to 9 people. Voicemail messages can also be accessed remotely so you don't have to be in the office to receive your faxes.

- SVD Technology
- Full Duplex Speakerphone allows you to use your PC just like a telephone

FMBAN003

\$269

Purchase before 31
December and receive
a free Camera



Simple Computing 56

The easiest way to connect to the Internet. Provides all the tools you need to start exploring the Internet today. The CD-ROM offers World Wide Web Browsers, ISP access tools, email and software drivers.

- V.90 & 56Kflex fax, data & voice capabilities
- SVD & Speakerphone ready

FMSIM000

\$195

Nikon Digital Cameras & Scanners

Nikon
Coolpix
900
Digital Camera

The Coolpix 900s is a 1.3 million pixel, 8mb digital camera. It uses a traditional 9 element Nikkor lens including a 3 x Optical zoom, precision 945 focus steps and 3 metering modes to capture true Nikon quality shots.

- High Resolution 1280 x 960 pixels - JPEG format
- 8mb Compact Flash memory card
- High Res 114000 pixel TFT LCD screen + Optical viewfinder
- 3 x Optical Zoom and 2 x digital doubler
- Multi Synch External Flash Terminal
- Latest power saving technology
- Spot, Centre weighted and Matrix metering options
- 2 frames a second in VGA mode
- Accepts fisheye and wideangle Nikkor converters
- Built in Flash
- AC Adaptor available
- Adobe PhotoDeluxe™ software

IONIK002

\$1745Nikon LS-2000
Film Scanner

The new Nikon Super Coolscan 2000 is a high resolution 2700 dpi, 12 bit A/D scanner able to scan each image in just 20 seconds. The new Coolscan 2000 uses new 'CleanImage' technology removing dust, scratches and other defects from the image.

- Full colour 2700 dpi scans in 20 seconds
- Batch Scanning
- Hot Swappable adapters - Film Strips or APS Film Adaptor
- Auto Slide Feeder SF-200 option (50 Slides)
- Negatives or Transparencies
- Autofocus
- Adobe Photoshop LE

IONIK000

\$2450Nikon LS-30
Coolscan III
Film Scanner

The new LS-30 Coolscan III is a 2700 dpi, 10 bit A/D conversion scanner which will scan at full resolution in just 30 seconds. The Coolscan III uses CleanImage™ dust and scratch removal and will accept the Hot Swappable adaptors.

- Full colour 2700 dpi scans in 20-30 seconds
- Hot Swappable adaptors - Film strips or APS Film Adaptor
- Nikon Colour Management
- Autofocus
- Clean Image™
- Negatives or Transparencies
- Adobe Photodeluxe™ 2.0

IONIK001

\$1359

Networking

NETGEAR



Adelong Computers

PRINT SERVER

PS104 10Mbps Print Server

Ideal for a small network, the PS104 caters for 1 parallel printer. In addition the PS104 sports a built in 4 port ethernet hub to save space and costs.



NWNGR000 **\$345**

PS110 10/100Mbps Print Server

Perfect for the office environment, the PS110 connects to 2 parallel printers to a 10 or 100 Mbps hub/switch, providing effortless transition from Ethernet to Fast Ethernet

NWNGR001 **\$459**

ETHERNET HUBS.

A 6 Port 10Mbps HUB with uplink port for easy expansion.



CODE	Description	Price
NWNGR005	EN108TP 8 Port Hub with 10Base-T support	\$129
NWNGR007	EN116AV 16 Port Hub with 10Base-T, AUI and BNC support	\$290

DUAL SPEED HUBS

The NETGEAR DS108 provides 8 autosensing dual speed ports to connect 8 PC's at 10 or 100 Mbps making network speed upgrades easy and effortless.

NWNGR015 **\$575**



Code	Description	Price
NWNGR015	DS108 8 Port Dual speed hub	\$575
NWNGR008	DS508 8 Port Dual speed hub - Stackable	\$850
NWNGR009	DS516 16 Port Dual speed hub - Stackable	\$1535

NETWORK CARDS

The FA310TX is an autosensing 10/100Mbps Ethernet PCI adapter designed to support the next generation of network applications.

NWNGR010 **\$79**

The FA410TX is 10/100Mbps PCMCIA Ethernet card. With the FA410TX your laptop is compatible with 10Mbps Ethernet with built in migration to 100Mbps Fast Ethernet; all for a 10Mbps price.

NWNGR011 **\$245**

FAST ETHERNET STARTER KIT

FB104AN

- This Starter Kit contains
- 2 x 10/100 PCI Network Cards
- 4 Port 100Mbps Hub
- 2 x CAT 5 Cable

\$335

NWNGR015

SB104AV

- 2 X 10/100 PCI Cards
- 4 Port 10Mbps Hubs
- 2 X CAT 5 Cable

\$219

NWNGR016



TOLL FREE SUPPORT 7 DAY / 24 HOURS with Netgear products

Bay Networks

Spirit

SPiRiT

PCMCIA



Spirit Scorpion 56 FMSP1009 **\$260**

The Spirit Scorpion 56 fax/modem PC Card offers the features of a desktop fax/modem in a small "credit-card" size. Both KFlex and V90. Ready, the Scorpion 56 is a breeze to install and comes supplied with a full compliment of software. This PC Card enables the mobile professional to exchange data faster using a range of notebooks/palmtops running Win 3.1x/95/98/NT/CE.

PCMCIA Ethernet Adaptor NWSIP000 **\$99**

Multimedia



\$145
MMSP1000

Spirit TV Video Card

Turn your PC into a TV. PCI card that brings full TV reception capabilities to your PC. Features full motion video and "still" capture.

MODEMS

NEW MODEL

K56 Flex + V.90

Spirit 560SP External 56,000bps FMSP1007 **\$179**

Internet Voice fax/modem with Speakerphone + SVD external 56k high speed fax/modem that supports the Rockwell K56Flex standard and popular data & fax standards up to 33,600bps. Hardware based error correction & data compression. Includes Windows fax and communications software with voice mail system, plus Windows Internet software.

All Modems include:

- 9/25 serial cable and Power supply(ext. model)

- Phone cord (all models)
- Installation instructions & documentation
- Software: Internet dialler & browser, data terminal emulation software, send receive fax application and voice mail system

Code	Description	Price
FMSP1007	Spirit 560SP External 56k Fax/Modem SVD	\$179
FMSP1006	Int. 56K,SVD, Spk Ph.	\$Call

Spirit Ranger 56K
\$99 FMSP1008
SPECIAL PRICE with any Adelong System.
Call for details.

Networking

Spirit networking includes a full compliment of NICs and Hubs in 10, 100 and 10/100 configurations.



5 Port Hub	NWSP1003	\$89
PCI Network Cards	NWSP1002	\$55
ISA Network Card	NWSP1001	\$39
10/100 PCI NIC	NWSP1001	\$105

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Sales Hotline 02 8344 3160



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D-Link D-Link Networking

Ethernet Cards

10/100Mbps PCI Fast Ethernet Card

Ensure your future network upgrades are catered for with this 10/100 auto-negotiating network adapter. Plug and Play support for trouble free installation.



\$56
NWDLI002

NWDLI000	DE-220PCT ISA PnP 10Mbps Ethernet Adapter	\$35
NWDLI001	DE-220PCT PCI PnP 10Mbps Ethernet Adapter	\$40
NWDLI006	DE-905 Ethernet Network Kit (inc. 5-Port Hub, 2 x 10Mbps ISA Ethernet, 2 x 7 Meter CAT 5 Cable)	\$195

56K Fax/Modems

DFM - 560 High Speed Fax/Modems



\$165
NWDLI000

FMDLI001	56K Internal Modem	\$135
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Ethernet & Fast Ethernet Switches

For a cost effective solution to improving network performance, D-Link's range of switches. Utilizing a switch to segment your network will reduce unwanted network congestion and hence improve its performance.



8 Port 10/100 N-Way Switch DES-1008

Featuring 8 x 10/100 ports, the DES-1008 is ideal for multiply high speed servers or deployment in server forms

\$1125
NWDLI022

**SPECIAL
VALID TILL
DECEMBER 31ST**

NWDLI011	DES-810 10 Port Ethernet Switch with 8 x 10Base-T & 2 x 100 BaseTX	\$875
NWDLI015	DES-815 12x10Mbps & 3x100Mbps Port Switch	\$745

Ethernet PCMCIA Cards

10/100Mbps Fast Ethernet PCMCIA Card

Make the most of your notebook computer by ensuring that it can handle both 10Mbps Ethernet & 100Mbps Fast Ethernet Networks no matter where you go.



\$206
NWDLI013

NWDLI003	DE-660CT PCMCIA 10Mbps Ethernet Card	\$115
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10 & 100Mbps Ethernet HUBS

8 Port 10/100 N-Way HUB

These hubs provide an easy and cost effective transition to Fast

Ethernet whilst remaining compatible with existing 10Base-T networks. Fully scalable to 80 ports in a 5 port stack.



\$745
NWDLI012

NWDLI019	DFE-916 16 Port 10/100 N-Way Stackable HUB	\$1395
NWDLI020	DFE-2624 24 Port 10/100 N-Way Stackable HUB	\$1860
NWDLI017	DE-805TP 5 Port 10Base-T Ethernet Hub	\$109
NWDLIxxx	DE-809TP 9 Port 10Base-T Ethernet Hub	\$150
NWDLI005	DE-816TP 16 Port 10Mbps Hub -Rack Mountable	\$335

Printer Servers & Transceivers

Turn any printer into a network printer through D-Link's range of print servers. Supporting multiple protocols and multiple high speed printer ports, these devices bring a high level of flexibility and performance to printer sharing over a network.

The DP-300 supports 2 x Parallel printers and 1 x

Serial printer hence allowing simultaneously connections to as many as 3 printers whilst reducing demands on network servers. In addition, the print server can connect to your network via any 10Mbps or 100Mbps port.



\$459
NWDLI015

NWDLI023	DP-101 1 Port Pocket Size Ethernet Print Server	\$299
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Networking

TRENDnet
We are the Trend for Fast Ethernet

ADELONG
AUSTRALIA

TRENDnet ...High Quality, Cost Effective Networking

* Life time warranty



**16-port 100Base-TX
Stackable Ethernet Hub (19" Rack Mount)**
This model provides an exceptional opportunity
for expansion.

\$850

8-port/5-port 100Base-TX Mini Hub

An additional uplink port is built into the hub to permit
easy expansion, while extensive front-panel LED's
provide instant trouble shooting capabilities.

8-port **\$297** 5-port **\$173**

8-port 100Base-TX Stackable Ethernet Hub (19" Rack Mount)

By stacking a total of 6 hubs together and by linking 2
stacks raises the total number of supported ports to 94.

\$2151



10/100Mbps Multi-protocol PRINT SERVER

This Fast Ethernet multi-protocol print server is
equipped with auto-sensing 10/100Mbps N-way
interface. With 2 high-speed parallel ports and 1 serial
port, this print server can connect with as many as 3
printers while simultaneously eliminating bottlenecks.

\$468

Code	Description	Inc
Software configurable ISA Adapters		
NWTR000	Software Configurable 16-bit ISA Ethernet Combo Card (TP & BNC)	\$30
TE-16PnP Series Plug-n-Play ISA Adapters		
NWTR001	PnP 16 bit ISA Ethernet Card (TP)	\$30
NWTR002	PnP 16-bit ISA Ethernet Combo Card (TP & BNC)	\$32
TE-PCI Series High-Performance PCI Adapters		
NWTR003	PnP 32-bit PCI Ethernet Card (TP & BNC)	\$36
PCMCIA & Pocket Adapters		
NWTR005	10Mbps PCMCIA Ethernet Combo Card (TP & BNC)	\$95
10Base-T Unmanaged Hubs		
NWTR007	5 RJ-45 ports Ethernet Mini Hub	\$71
NWTR008	8 RJ-45 ports Ethernet Mini Hub	\$87
10/100 Mbps Fast Ethernet Adapters		
NWTR013	10/100 Mbps Fast Ethernet Adapter for PCI/Digital Chipset	\$79
100 Mbps Fast Ethernet Hubs		
NWTR014	5 port 100Base-TX Mini Hub/External power adapter	\$178
NWTR015	8 port 100Base-TX Mini Hub/External power adapter	\$297
10/100 Mbps Dual Speed Hubs		
NWTR021	8-Port 10/100 MBPS Stackable Dual Speed Switching Hub	\$534
NWTR022	16-Port 10/100 MBPS Stackable Dual Speed Switching Hub	\$968
10/100 Mbps Switching Hubs		
NWTR023	2 port (2 10/100Mbps) N-Way Switch	\$317
NWTR025	10-port (2 100Mbps + 8 10Mbps) Switch	\$813
NWTR026	8 port (8 10/100Mbps) N-Way Switch	\$1356
Print Servers		
NWTR028	EtherPort Print Server for Novell, TCP/IP, Win95/NT (2P + 1 S)	\$310
NWTR031	10/100 Mbps Multi-Protocol Print Server (2P + 1S)	\$468

TRENDnet
Low-Cost True Dual Speed Hubs
TRENDnet has introduced two
new
dual speed switchable hubs, the



TE100-DX8 and the TE100-DX16.

- These are 8 and 16 port (respectively) true dual-speed 10/100Mbps switching hubs that provide a new level of flexibility and easy migration between bandwidth. Each port supports auto sensing between 10Mbps Ethernet and 100Mbps Fast Ethernet.
- The TE100-DX8 and the TE100-DX16 are inter-stackable up to 5 hubs. With their built-in switch modules, these hubs are true 10/100Mbps interconnectability.
- These hubs feature plug and play installation with auto-port configuration, scalable and stackable expansion capabilities, plus auto sensing and auto-negotiation. Backed by a lifetime warranty and competitive pricing.

TE100-DX8 **\$534** TE100-DX16 **\$968**



8-port N-way Switching Hub

Its auto-sensing technology enables information to be
forwarded automatically by the switch without
interfering with other segments. Its uplink port
provides easy cascading to another switch, hub or
repeater.

\$1356

10-port Switching Hub

The TE100-S28 is great for systems that have
integrated 10Base-T and 100Base-TX products. This
switching hub has 8 10Mbps twisted-pair ports and 2
100Mbps twisted-pair ports.

\$813



10/100Mbps PCMCIA Ethernet Card

With the TE100-PC16, laptop users can hook up their
laptops to 10Mbps or 100Mbps LAN. This Ethernet
Card can support a full-duplex mode increasing the
data transfer rate to 200Mbps.

\$203



10/100Mbps Fast Ethernet Adapter for PCI (digital chipset)

Utilising high-speed 100Base-TX technology and
transmitting data over the Ethernet network at
10Mbps or 100Mbps, the TE100-PCI can operate in
half/full-duplex modes thus doubling the network
bandwidth to 20 or 200Mbps. The adapter runs in
bus master mode by directly sending and receiving
Ethernet packets while using minimal aid from the
CPU.

\$36

SOLID INTERNATIONAL USER-BASE

TRENDnet is proud to have an installed base with the following companies:

- American Airlines
- American Express
- AT&T
- Compaq Computers
- Computerland
- Dun & Bradstreet
- Epson America
- Gateway USA
- Honeywell, Ltd., Canada
- IBM
- Lotus Development
- Motorola
- Samsung Electronics
- Sun Microsystems
- Symantec
- Toshiba, Japan
- University of Arizona
- University of Colorado
- Xerox, Canada

Our commitment to performance, service, and quality have given us the opportunity to work with industry leaders. We stand by the companies that we serve.

*on selected products

TRENDnet
We are the Trend for Fast Ethernet

Sales staff are available (est) 9am-6pm Monday to Friday, 10am-4pm Saturday
Technical Support (5 Days a week 9am-6pm) Phone (02) 8344 3160



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Sales Hotline 02 8344 3190

RICOH

CD Writers

A single drive that does it all. Reads, writes, Rewrites CD data.

The Ricoh MP6200 series drives have multi-function capabilities so they can efficiently handle any CD-based media from the world's first re-writable CD, Ricoh's CD-RW, to the write-once CD-R and CD-Rom. With just one drive, you can always choose the perfect media to suit your applications. Now supporting random access writing.

32X CD ROM KIT

- High Speed 32 X MAX
- CD ROM drive, CDRW Read Compatible
- Bonus Webster's World Encyclopedia 1998 Full Version.

\$145

MMRIC002



MP6200AR (EIDE) ATAPI
Internal EIDE CD-R/CD-RW Drive Direct CD Ver. 2.0, Easy CD Creator 95/NT, 1 CD-R Disc, 1 CD-RW Disc Operation Manual, Audio Cable, Mounting Screws

\$599

MMRIC001

Kit includes \$35 of Media products



Fast writing and reading
6x read 2x write,
CD-RW and CD-R
writing, unlimited
media selection

MP6200SR (SCSI)

Internal SCSI CD-R/CD-RW Drive Direct CD Ver. 2.0, Easy CD Creator 95/NT
4 CD-R Disc, 1 CD-RW Disc
Operation Manual, Audio Cable, Mounting Screws

\$695

MMRIC000

Ricoh CD-RW
Disc 74 Mins
650Mb
MMRIC003 **\$35**

Ricoh CD-R
Disc 74 Mins
650Mb
MMRIC004 **\$4**

UPS & LINE FILTERS



Pulsar EL UPS

- Entry level solution
- Total protection for your equipment

Code

PSMGE002
PSMGE003

Model

EL2+ 5min backup-time for a PC
EL4+ 20min backup-time for a PC

Price

\$240
\$320

MGE UPS Pulsar Series For small businesses

MGE UPS SYSTEMS is the first UPS manufacturer to design a range of UPS that meet the specific requirements and restrictions of small businesses.

Pulsar ES+ UPS

- Total protection for your equipment
- Power protection with backup
- Solution pack software included
- Fax/Modem line filtering

Code

PSMGE000
PSMGE001

Model

ES2+ 5min backup-time for a PC
ES5+ 20min backup-time for a PC

Price

\$325
\$410

Power Filter

Computer and equipment protection!

- Powercor premium grade AC power filter technology to reduce surge/spike and transient damage.
- Power grid comes with 4 individually wired plugs.

Code

PSGEN004
PSGEN005

Model

ZAPTRAP - Multistage filter

ZAPCATCHER - Multistage filter with Telecom line surge protection

Price

\$140
\$150



backpack

EXTERNAL PARALLEL PORT DEVICES

Code

BUBAC001
BUBAC002
BUBAC003
BUBAC004

Model

Backpack PD / CD Drive
Backpack PD / CD Drive + Soundcard
Backpack 8GB Tape Backup 8000T Travan Drive
Backpack 2.1Gb Hard Drive

Price

\$485
\$535
\$395
\$599



CD Writers & Accessories



Adelony Computers

TRAXDATA

the biggest CD data-storage brand on the Planet!



Purchase any Traxdata product and you will go into the draw to win the sports car of your dreams or 14 consolation prizes of the latest DVD Players!

- Easy to use
- Easy to install
- Affordable
- Make your own high quality CDs



CD-Recordable Driver CDE4120 EL PRO

- 4x/12x SCSI Recorder
- WinonCD 3.5 CD Mastering Software (OEM version)
- Packet CD UDF Recording Software for Win95®
- 2x Traxdata CD-R Discs & Marker Pen
- Manuals

MMTRA002 **\$645*** (Int.)

MMTRA003 **\$765*** (Ext.)



PressIT CD Labelling Kit

PressIT CD Labelling Kit uses a clever yet simple design, allowing you to put professional looking labels on your CDs. This neat and compact labelling system provides the perfect answer to all those CD labelling task which up to now have been a real hassle.

\$75 MMTRA020

*add \$100 to include Ultra SCSI Adaptor
1.2GB Data Storage Capacity for all recorder kits

For PCI Bus

SCSI card kit

\$139

MMTRA006

Other Items

Code	Model	Price
MMTRA007	BLANK CD-R	\$3.50
MMTRA008	BLANK CD-RW	\$29
SWTRA007	WinonCD Pro V3.5	\$185



Re-Writable Driver CDRW2260 EL PRO

2x Record/2x Erase/6x Playback SCSI Recorders packed complete with:

- WinonCD 3.5 CD Mastering Software (OEM version)
- Packet CD UDF Recording Software for Win95®
- CD Marker Pen
- Manuals

MMTRA016 **\$650*** (Int.)



Re-Writable Driver CDRW2260 EL PLUS

2x Record/2x Erase/6x Playback IDE Recorders packed complete with:

- WinonCD 3.5 CD Mastering Software (OEM version)
- Packet CD UDF Recording Software for Win95®
- Cable
- CD Marker Pen
- Manuals

MMTRA004 **\$549** (Int.)

MMTRA018 **\$670** (Ext.Parallel)



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Sales Hotline 02 8344 3190



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TEAC Teac Drives

4 X 12 CD Recorder

12X Read & 4X Write

The new CD-R55S from TEAC offers all of the advantages of true 4X write performance. It takes just fifteen minutes to create a typical 650MB CD - only half the time of traditional 2X writers. This means you'll spend less time burning discs and more time creating multimedia content. And with its 12X read capabilities and 165ms average access time, no other CD Recorder reads CDs faster

Accurate, Reliable, Efficient

The TEAC 4X CD Recorder is engineered for high reliability. Its 1MB buffer virtually eliminates those dreaded buffer underruns and insures that you'll burn discs successfully every time with 100% data accuracy. The TEAC 4X CD Recorder supports packet writing for low overhead and can also record onto part of the disc or track at any one time.

Affordable Integration

The TEAC 4X CD Recorder supports all leading PC and Macintosh based authoring programs. In addition, its internal design, caddyless power tray and affordable price make sense for users looking for an affordable, reliable and high performance drive



SCSI Drive
\$610
MMTEA002

Retail Kit
\$755
MMTEA004

SCSI Retail Pack including
Adaptec SCSI Card, Cables, CDR
Media, Mastering Software

32X CDROM Drive

Experience 32X Performance

The all new CD-532 series of 32X CD-ROM drives provide the ultimate in playback performance. They benefit from CAV technology that optimizes the data rate by rotating the disc at a constant speed. And the TEAC 32X takes full advantage of the multitasking capabilities of Windows by utilizing less of your computers processing power.

See and Feel the Difference

You'll experience all of the advantages of the TEAC 32X from the moment you start. Its maximum 4.8MB per second data transfer is four times faster than 8X drives. Add its ultra fast 85ms access time, and you have the perfect drive for quick software installations, extensive database searches and demand multimedia applications.

Available in both SCSI &
ATAPI interfaces.

ATAPI IDE
\$99
MMTEA001



SCSI
\$189
MMTEA003

Portable CD-ROM Drive CD-ROM to Go

The TEAC PortoCD 10X CD-ROM drive brings CD-ROM capabilities to your notebook. Use at our home and office, or take it when you're on the go. Whether you're installing software, accessing reference data, running your favorite CD-ROM title or playing an audio CD, the TEAC PortoCD is the perfect mobile solution.

Experience 10X Performance

Get true 10X playback performance with the TEAC PortoCD drive. You'll experience all the advantages of CD-ROM from the moment you put it to use. Its quicker data searches and smoother playback performance frees up more of our notebook's processing power.

Easy PCMCIA Connection

The TEAC PortoCD utilizes your n PCMCIA connector for a clean sir installation. In addition its plug play compatible and includes everything you need to ass CD-R to your notebook computer.

\$465
MMTEA000



TEAC 1.44MB Floppy Drives

For performance and reliability backed by a comprehensive 3 year warranty look no further than the TEAC FD-235 Floppy Drive. As used by Compaq and IBM, the FD-235 is regarded as the worlds best performing and most reliable floppy drive.



\$37
FDTEA000

Mitsui Gold CDR Media

Mitsui Gold CD-R is a highly specialized recordable compact disc that permanently stores any digitized data. It is distinct from other write once media in its playback compatibility with conventional audio CD and computer CD-ROM players. Once recorded, the Mitsui Gold CD-R becomes a high quality CD-ROM for repeated playback equivalent to a mass produced CD or CD-ROM.

\$3
MMGEN020





BJC-50 PRCAN020 **\$598**

- Half the size of the BJC-80 but not half the performance.
- Featuring a InfraRed Port and LithiumIon Battery which is good for 100 A4 prints.
- Maximum resolution of 720dpi at up to 5.5ppm
- Snap in the optional scanner head for 360dpi full colour scanning.

PRCAN001 **\$137** Scanner head



BJC-80 PRCAN000 **\$349**

- Drop Modulation Technology - the dual drop size breakthrough that **produces smoother colour gradations.**
- Office laser quality finish & B&W speeds up to 5 pages per min. with dedicated black cartridge.
- Windows® 95 compatible IrDA infrared port for cable-less communications.
- Fits in half a briefcase & only 1.4Kg!

- **Optional scanner head for colour graphics, OCR & faxing.**

PRCAN001 **\$137** Scanner head



BJC-4310SP PRCAN022 **\$268**

NEW IMPROVED SUPER ECONOMY MODE

- drop modulation technology uses dual drop sizes for smoother colour gradations with standard and photo realism inks.
- optional photorealism inks for photo gold standard printing.
- speed black cartridge prints up to 4.5 pages / minute.
- optional colour scanner for image acquisition , fax and copying functions (with appropriate software)
- plus banner printing and better internet printing.



BJC-255SP PRCAN017 **\$175**

- Super Economy mode for colour and B&W.
- Photo Mode printing for colour that rivals more expensive four-colour systems.
- Prints up to 2400 B&W pages and 600 colour pages.
- New high capacity black cartridge 20% more ink, no extra cost.
- Up to 5 times the output of direct competitors.



BJ-4650 PRCAN016 **\$435**

- A3 colour printing, **perfect for CAD, DTP and spreadsheet work.**
- Supports black & various colour cartridge options.
- PhotoRealism option for photographic reproduction with richer, more life-like colours.
- Optional Scanner head.

PRCAN023 **\$137** Scanner head



BJC-7000 PRCAN012 **\$435**

- 7-colour ink system and 9 saturation levels per pixel for **incredibly rich photographic half-tones.**
- Combined total of 1088 print nozzles firing up to 10,000 drops per second!
- P-POP (Plain Paper Optimised Printing) gives plain paper a coated paper quality finish.
- Documents printed with P-POP are 99.4% water fast!

BJC-5000 PRCAN023 **\$599**

- 1440 dpi resolution
- New dual cartridge printin system
- A3 capable
- 7 colour photo inks
- Up to 7.5 ppm print speed

new



FB320P IOCAN002 **\$210**

All the advanced technology of the 620P at 300 dpi



FB620P IOCAN003 **\$275**

It takes up less desktop real estate than any other colour flatbed scanner on the planet yet still **delivers exceptional 600 dpi scanning performance-ideal for businesses** with a variety of scanning needs.

- New Contact Image Sensor technology
- Optical Resolution 600 dpi
- Maximum Resolution 2400 dpi x 2400dpi
- 30 bit Colour

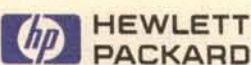
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HP Printers

HP 695C

The affordable printer for easy, quality color results.

The HP DeskJet 695C printer offers efficient results with up to 5 pages per minute black and 1.7 pages per minute color printing. It delivers sharp blacks and vibrant colors, even on inexpensive plain paper you use most. HP's RealLife Imaging System, which incorporates HP ColorSmart II technology, ensures perfect color every time by automatically adjusting color settings, so what you see on screen is what you get on paper.



\$339 PRHPD039

HP 710C

HP's brilliant photo-quality color printer at the right price.

Print speeds of up to 6 pages per minute black, 3 pages per minute color and smudge resistant printouts, with HP's exclusive fast drying inks, will allow you to get your work done fast. The HP DeskJet 710C makes everything you print look great, even on plain paper. With HP's RealLife Imaging System which includes HP's exclusive PhotoREt II color layering technology, brilliant photo-quality color printing is easy.



\$430 PRHPD041

HP LaserJet 1100

The HP LaserJet Printer and all-in-one Printer or Copier or Scanner for any size business

Quality laser printing - faster than ever HP has always set the pace in laser printing technology. The new generation HP LaserJet 1100 series sets another impressive pace, delivering a stunning 8 pages per minute print speed. The 600 dpi print resolution with HP's Resolution Enhancement technology (REt) makes every document more professional.



\$799 PRHPD040

HP 6L

The ideal desktop laser printer. 6 pages per minute at 600dpi, this laser printer is fast and reliable. HP's biggest seller, this laser printer provides outstanding value for money. Drivers for Windows 95/98, and Windows NT.



\$645 PRHPD009

DESKJET

Code	Model	Price
PRHPD002	Deskjet 670C Color inkjet Printer 600dpi	\$245
PRHPD025	Deskjet 890Cxi 2ppm Color /9ppm Black	\$775
PRHPD031	Deskjet 720C Printer 8PPM Black 600dpi	\$519

LASERJET

Code	Model	Price
PRHPD010	Laserjet 6P 8ppm 600dpi	\$1399
PRHPD011	Laserjet 6MP with Postscript	\$1697

EPSON

Epson Printers

STYLUS COL. 740

The new EPSON Stylus 740 is targeted at business/corporate and professional graphics users. These are users who demand a printer offering the highest performance and speed, maximum output quality, flexible options and affordability in purchase price and running costs. Designed for both Microsoft Windows 3.x/95 and Macintosh, the EPSON Stylus COLOR 740 also features optional network connectivity and optional software PostScript RIP. Printing at 1440 x 720 DPI and a maximum of 7ppm the Stylus 740 eclipses many desktop laser printers whilst providing unrivaled photo reproduction

PC/MAC
COMPATIBLE



\$435
PREPS011

STYLUS COL. 700

Industry leading A4 1440dpi printing with Epson's unique 6 color ink system. Excellent for life-like photo reproduction and graphics on plain and coated paper.



EPSON STYLUS COLOUR 440

The EPSON Stylus COLOR 440 is a remarkable new printer that produces dazzling, photo-quality right out-of-the-box! The EPSON Stylus COLOR 440 features photo-quality output with print resolutions of up to 720 x 720 dpi on plain paper.



\$259
PREPSxxx

STYLUS COL. 640

1440X720 DPI, 3PPM, WIN COMP. With its remarkable 1440 x 720 dpi capability, the Epson Stylus COLOR 640 sets a new standard for cost-efficient, photo-quality colour printing without the need for expensive options.



\$345
PREPS019

STYLUS PHOTO EX.

The Epson Stylus Photo EX is the perfect printer for photo reproduction, pre-proof graphics. Industry-leading 1440dpi resolution with a six-colour ink system and A3 paper handling.



\$845
PREPS015

STYLUS COL. 850

It's industry-leading print resolution of up to 1440 dpi and high-speed printing capability makes the EPSON Stylus COLOR 850 the ideal printer for busy professionals. What's more, its ability to produce outstanding 1440 x 720 dpi printouts on plain paper allows eye-catching colour charts and graphics to be included in all printed material.



\$745
PREPS016

Ink & Toner



Adelony Computers

Canon

Code	Description	Printer compatibility	Price
INCAN000	BC01 BLACK	BJ10/20	\$45
INCAN001	BC02 BLACK	BJ200/BJ210/BJ240	\$45
INCAN002	BC05 COLOUR	BJ210/240	\$49
INCAN003	BC06 PHOTO COLOUR	BJ240	\$49
INCAN004	BC06 PHOTO COLOUR KIT	BJ240	\$65
INCAN005	BC09F FLUO COLOUR	BJ210/BJ240	\$79
INCAN006	BC10 BLACK & HEAD	BJ30/BJ70	\$55
INCAN007	BC1-10 BLACK	BJ30/70	\$25
INCAN008	BC11 COLOUR & HEAD	BJ70	\$65
INCAN009	BC1-11 BLACK (3 PK)	BJ70	\$25
INCAN010	BC1-11C COLOUR (3 PK)	BJ70	\$35
INCAN011	BC20 BLACK & HEAD	BJ4000 SERIES	\$49
INCAN012	BC21 COLOUR & BLACK	BJ4000 SERIES	\$79
INCAN013	BC121 BLACK	BJ4000 SERIES	\$14
INCAN014	BC121C TRI-COLOUR	BJ4000 SERIES	\$29
INCAN015	BC22 PHOTO	BJ4200/BJ4500	\$75
INCAN016	BC22 PHOTO KIT	BJ4200/BJ4500	\$95
INCAN017	BC29F FLUO COLOUR	BJ4000 SERIES	\$75
INCAN018	BJI201B BLACK	BJ600 SERIES	\$25
INCAN019	BJI201C CYAN	BJ600 SERIES	\$15.50
INCAN020	BJI201M MAGENTA	BJ600 SERIES	\$15.50
INCAN021	BJI201Y YELLOW	BJ600 SERIES	\$15.50
INCAN022	BJI642 BLACK	BJ300/330	\$29
INCAN023	BJI643 BLACK	BJ800/880	\$45
INCAN024	BJI643C CYAN	BJ800/880	\$49
INCAN025	BJI643M MAGENTA	BJ800/880	\$49
INCAN026	BJI643Y YELLOW	BJ800/880	\$49
INCAN027	BJI801 BLACK	BJ80	\$39
INCAN028	BC03 BLACK	BJ210SP	\$45
INCAN029	BC60 BLACK	BJC7000	\$59
INCAN030	BC61 COLOUR	BJC7000	\$69
INCAN031	BC62 PHOTO COLOUR	BJC7000	\$95



Code	Description	Printer compatibility	Price
INHPD000	HP51633M BLACK	HP PORTABLE	\$49
INHPD001	HP51626A BLACK	HP 500 SERIES	\$49
INHPD002	HP51629A BLACK	HP 600 SERIES	\$55
INHPD003	HP51645A BLACK	HP850C/1600	\$50
INHPD004	HP51640A BLACK	DJ 1200 SERIES	\$50
INHPD005	HP51606A BLACK	HP PAINTJET XL	\$55
INHPD006	HP51639A BLACK	PAINTJET XL300	\$39
INHPD007	HP51625A COLOUR	DJ500 SERIES	\$49
INHPD008	HP51649A COLOUR	HP 600 SERIES	\$55
INHPD009	HP51641A COLOUR	HP850C	\$55
INHPD010	HP51640C CYAN	DJ1200/1600	\$55
INHPD011	HP51640M MAGENTA	DJ1200/1600	\$55
INHPD012	HP51640Y YELLOW	DJ1200/1600	\$55
INHPD013	HP COLOUR PHOTO KIT	HP690C	\$79
INHPD014	HP 16A PHOTO INK	HP690/692/693	\$59
INHPD022	HPC1823A COLOUR	HP720/890/1120	\$59

EPSON

Code	Description	Printer compatibility	Price
INEPS003	SO20025 BLACK	400/800/1000	\$35
INEPS004	SO20034 BLACK	COLOUR/PRO/PROXL	\$45
INEPS005	SO20036 COLOUR	COLOUR/PRO/PROXL	\$85
INEPS006	SO20047 BLACK	200/820/II/III	\$35
INEPS007	SO20049 COLOUR	II/III/820/1500	\$45
INEPS008	SO20062 BLACK	STYLUS 1500	\$65
INEPS009	SO20066 COLOUR	STYLUS PRO XL+	\$95
INEPS010	SO20089 COLOUR	400/600/800/1520	\$45
INEPS011	SO20093 BLACK	C400/500/600	\$35
INEPS012	SO20097 COLOUR	C500/200	\$49
INEPS013	SO20108 BLACK	C800/1520	\$45
INEPS014	SO20110 PHOTOCOLOUR	PHOTO 700/EX	\$45
INEPS016	SO20187 BLACK	STYLUS 440/640	\$40
INEPS017	SO20191 COLOUR	STYLUS 440/640/740	\$45
INEPS018	SO20126 BLACK	STYLUS 740	\$45

Toner Cartridge

Code	Description	Printer compatibility	Price	Code	Description	Printer compatibility	Price
TOHPD000	HP92295A	HP LASERJET II/III	\$135	TOHPD004	HP92291A	HP 451/451 MX/351	\$220
TOHPD001	HP92274A	HP 4L/4ML/4P/4MP	\$125	TOHPD005	HP.C3900A	HP 551/551 MX	\$325
TOHPD002	HP.C3906A	HP LASERJET 5L/6L	\$105	TOHPD006	HP92298Z	HP 4/4M/5/5N/5M	\$165
TOHPD003	HP92275A	HP IIP/IIIP/IIIP+	\$149	TOHPD007	HP.C3900A	HP 4V/4MV	\$275
				TOHPD008	HP	HP 5P/5MP/6P/6MP	\$145

Monitors

SONY



GDM-500PS \$3685 GDM-400PS \$2150 GDM-200PS \$1990 GDM-200ES \$1035

MOSON007	MOSON006	MOSON004	MOSON003
<ul style="list-style-type: none"> 21" Trinitron CRT (19.8" viewable image size) Sony Elliptical Correction System technology Super Fine 0.25-0.27mm Variable Aperture Grille Supports PC and Mac resolutions up to 1600 x 1200 @ 85Hz 	<ul style="list-style-type: none"> 19" Trinitron CRT (18.0" viewable image size) Sony Elliptical Correction System technology Super Fine 0.25-0.27mm Variable Aperture Grille Supports PC and Mac resolutions up to 1600 x 1200 @ 75Hz 	<ul style="list-style-type: none"> 17" Trinitron CRT (16.0" viewable image size) Sony Elliptical Correction System technology Super Fine 0.25mm Aperture Grille Pitch Supports PC and Mac resolutions up to 1600 x 1200 @ 70Hz 	<ul style="list-style-type: none"> 17" Trinitron CRT (16.0" viewable image size) Sony Elliptical Correction System technology Super Fine 0.25mm Aperture Grille Pitch Supports PC and Mac resolutions up to 1280 x 1024 @ 60Hz

Active Signal Correction (ASC), automatic screen sizing and centering Dual inputs N15 pin D-sub and 5 BNC

SONY DDS DAT DRIVES 5.25" INTERNAL SCSI

Call for range of External DAT Drives

Code	Description	Price	Code	Description	Price
BUSON007	2GB SONY SDT-2010E DDS-1 Drive	\$1195	BUSON008	4-8GB SONY SDT-5010 DDS-2 Drive	\$1595
BUSON000	2-4GB SONY SDT-4010E DDS-1 Drive	\$1345	BUSON009	12-24GB SONY SDT-9000/R DDS-3 Drive	\$2195

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Technical Support (5 Days a week 9am-6pm) Phone (02) 8344 3160

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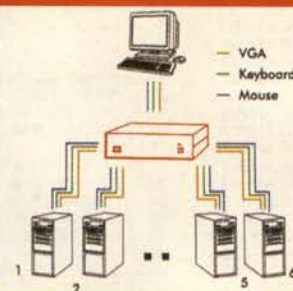
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Data Switches

Auto CPU Switch Box

A CPU switch allows a user to control multiple computers with the ease of using a single console. That is, a single keyboard, mouse and monitor can control up to 8 computers simultaneously. A perfect partner for network administrators or the enthusiast with two or more computers.

- Supports Mouse emulation and keyboard emulation for automatic PC bootup
- Provides Serial & keyboard interfaces
- Supports VGA, SVGA & Multisync monitors
- Three level cascading for easy expansion
- LEDs give current mode status



CS-102

Control up to 2 PCS with the entry level CS102

DSADE030 **\$245**

AT



CS-106

Perfect for those managing several PCs. Auto scanning for monitoring PCs periodically

DSADE020 **\$399**

AT



CS-122

Supports both PS/2 and AT Style computers transparently

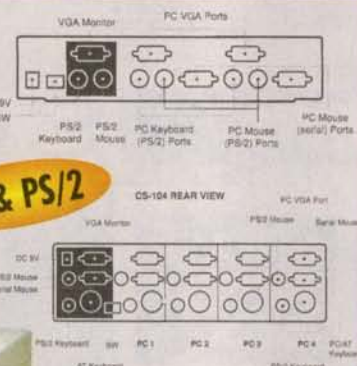
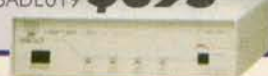
DSADE037 **\$275**

AT & PS/2

CS-104

CS - 104 4 Port Switch Box

DSADE019 **\$395**



CS-128

8 Port Switch Box

DSADE036 **\$695**

AT & PS/2



Item Code Description

CBGEN127 AT CABLE SET for CS-128

CBGEN128 PS/2 CABLE SET FOR CS-128

Price

\$39

\$39

Special Shielded Cables For CPU Switches

CBGEN098 AT CABLE SET

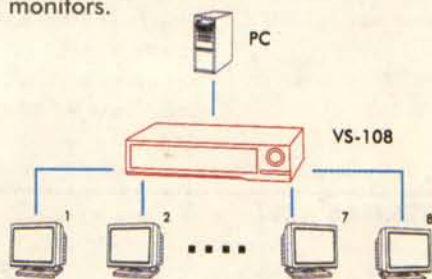
\$35

CBGEN099 PS/2 CABLE SET

\$39

Video Splitters

Video splitters are fast, flexible solutions for broadcasting video information to the public. They enhance video signals for long distance broadcasting. Great for presentations and demos, they allows 1 computer to hook up to several monitors.



CBGEN035 1.8M VGA Monitor Cable M/M

\$9

VS-102 2 Port Video Splitter

DSADE000 **\$95**

VS-104 4 Port Video Splitter

DSADE001 **\$135**

VS-108 8 Port Video Splitter

DSADE002 **\$195**



Cables



Adelong Computers



PS/2



RJ 45



BNC



serial mouse

USB CABLES

Item Code	Description	Price
CB-GEN155	1M USB CABLE A	\$15.00
CB-GEN156	1M USB CABLE B	\$15.00

PRINTER CABLES

CB-GEN000	6FT PRINTER CABLE	\$5.00
CB-GEN002	5 METERS PRINTER CABLE	\$12.00
CB-GEN003	10 METERS PRINTER CABLE	\$19.00
CB-GEN089	1.8M IEEE 1284 PRINTER CABLE	\$19.00

SERIAL CABLES

CB-GEN042	1M CENT50M TO CENT50M SCSI	\$15.00
CB-GEN043	1.8M CENT 50M CENT 50M SCSI	\$17.00
CB-GEN044	1M CENT 50M/DB25M SCSI	\$15.00
CB-GEN047	1M HONDA 50M/CENT 50M	\$25.00
CB-GEN048	1.8M HONDA50M/CENT50M	\$29.00
CB-GEN049	1M HONDA 50M/DB25 SCSI II	\$25.00
CB-GEN050	1M HONDA 50M/HONDA 50M	\$39.00
CB-GEN051	1M HONDA 68M/HONDA 68M	\$45.00
CB-GEN052	1M HONDA 68M/HON 50M	\$45.00
CB-GEN053	1M HOND A 68M/CENT 50M	\$45.00
CB-GEN083	HONDA 68 TO DB25 M SCSI III	\$45.00
CB-GEN057	INTERNAL SCSI III	\$85.00
CB-GEN060	INT SCSI CABLE 7 CONNECT	\$15.00

KEYBOARD & VGA CABLES

CB-GEN023	1.8M KEYBOARD EXT M/F	\$9.00
CB-GEN025	5M KEYBOARD EXT M/F	\$15.00
CB-GEN027	1.8M PS/2 KB EXT M/F	\$12.00
CB-GEN028	1.8M PS/2 KEYBOARD M/M	\$12.00
CB-GEN029	1.8M KEYBOARD CABLE M/M	\$10.00
CB-GEN030	1.8M EGA/MOUSE EXT 9F/9M	\$9.00
CB-GEN031	1.8M EGA/MOUSE 9M/9M	\$9.00
CB-GEN032	1.8M VGA EXT 15M/15F	\$9.00
CB-GEN036	MONITOR SPLITTER 15M/15F*2	\$15.00
CB-GEN037	1.8M RGB CABLE 15M/BNC*5	\$25.00

SCSI CABLES

CB-GEN042	1M CENT50M TO CENT50M SCSI	\$15.00
CB-GEN043	1.8M CENT 50M CENT 50M SCSI	\$17.00
CB-GEN044	1M CENT 50M/DB25M SCSI	\$15.00
CB-GEN047	1M HONDA 50M/CENT 50M	\$25.00
CB-GEN048	1.8M HONDA50M/CENT50M	\$29.00
CB-GEN049	1M HONDA 50M/DB25 SCSI II	\$25.00
CB-GEN050	1M HONDA 50M/HONDA 50M	\$39.00
CB-GEN051	1M HONDA 68M/HONDA 68M	\$45.00
CB-GEN052	1M HONDA 68M/HON 50M	\$45.00
CB-GEN053	1M HOND A 68M/CENT 50M	\$45.00
CB-GEN083	HONDA 68 TO DB25 M SCSI III	\$45.00
CB-GEN057	INTERNAL SCSI III	\$85.00
CB-GEN060	INT SCSI CABLE 7 CONNECT	\$15.00

SCSI TERMINATORS

CB-GEN045	CENT 50M SCSI TERM ACTIVE	\$25.00
CB-GEN046	CENT 50M TERM/C50M/C50F	\$19.00
CB-GEN054	HONDA 50M TERMINATOR ACT	\$25.00
CB-GEN055	HONDA 68M TERMINATOR ACT	\$39.00
CB-GEN056	INTERNAL TERMINATOR ACT	\$20.00

SCSI ADAPTORS

Item Code	Description	Price
CB-GEN131	HONDA50F/CENT50M	\$30.00
CB-GEN132	HONDA50M/CENT50F	\$25.00
CB-GEN133	HONDA50F/CENT50F	\$32.00
CB-GEN134	HONDA50F/DB25M	\$25.00
CB-GEN135	GENDER CHANGER CEN50 F/F	\$12.00
CB-GEN136	HONDA68M/CEN50F	\$35.00
CB-GEN137	HONDA68F/CEN50M	\$38.00
CB-GEN138	HONDA68M/HONDA50F	\$39.00
CB-GEN139	HONDA68F/HONDA50F	\$40.00
CB-GEN140	HONDA68M/HONDA68F	\$45.00
CB-GEN141	HONDA68F/HONDA68F	\$45.00
CB-GEN149	INT. SCSI 50F/68F	\$30.00
CB-GEN143	INT. SCSI 50F/68M	\$20.00
CB-GEN144	INT. SCSI 50M/68F	\$20.00
CB-GEN145	INT. SCSI 50M/68M	\$20.00
CB-GEN146	INT. SCSI 50M/50F BRACKET ADAPTER	\$20.00
CB-GEN147	INT. SCSI 50M/68F BRACKET ADAPTER	\$25.00
CB-GEN148	INT. SCSI 50M/DB25 BRACKET ADAPTER	\$20.00
CB-GEN150	INT. SCSI 68F/68F BRACKET ADAPTER	\$35.00

NETWORKING

CB-GEN065	5M COAXIAL CABLE WITH BNC	\$12.00
CB-GEN066	10M COAXIAL CABLE WITH BNC	\$15.00
CB-GEN067	20M COAXIAL CABLE WITH BNC	\$20.00
CB-GEN070	BNC TERMINATOR	\$3.50
CB-GEN071	BNC T CONNECTOR	\$3.50
CB-GEN073	2M RJ45 CABLE	\$10.00
CB-GEN074	5M RJ45 CABLE	\$15.00
CB-GEN076	10M RJ45 CABLE	\$20.00
CB-GEN078	20M RJ45 CABLE	\$30.00
CB-GEN081	40M RJ45 CABLE	\$59.00
CB-GEN084	2 METRE RJ45 CABLE-CROSS	\$12.00
CB-GEN087	10 METRE RJ45 CABLE-CROSS	\$25.00

PARALLEL

CBGEN038	1.8M PARA LAPLINK DB25M/M	\$12.00
CBGEN039	5M PARA LAPLINK DB25M/M	\$15.00
CBGEN040	10M LAPLINK PAR DB25M/M	\$19.00

POWER & I/O

CBGEN058	FLOPPY CABLES	\$6.00
CBGEN059	IDE CABLE 3 CONNECT	\$6.00
CBGEN061	INTERNAL POWER SPLITTER	\$5.00
CBGEN062	1.8M WALL TO PC POWER CABLE	\$6.00
CBGEN063	1.8M PC TO MONITOR POWER CABLE	\$7.00



Centronics 50



Honda 68



Honda 50



USB A



USB B



DB 25

Multi-Function Devices

HP Officejet 1170C / 1175C

The new Officejet 1170C Series is the latest, easy to use All-in-One device that provides professional quality & performance. The Officejet 1170C provides color copying, printing, scanning as well as traditional fax capabilities with its integrated document feeder. The Officejet 1170C is no sloth either, printing 9ppm in mono and 5ppm in color. For added features, the Officejet 1175C extends the above features to include an automatic document feeder for network scanning.



PRHPD035	Officejet 1170C	\$1385
PRHPD037	Officejet 1175C	\$1775

HP Laserjet 3100

The Laserjet 3100 combines a 600DPI Laser printer with traditional features such as faxing, scanning and copying. Great for the office, the Laserjet 3100 manages 6ppm of professional quality prints with a 100 Sheet paper input bin.

PRHPD034
\$1370



HP Officejet 635

A color printer, copier, scanner and fax in one.

- Prints 5ppm at 600DPI
- Plain Paper Fax with 100 Speed dial



PRHPD033 **\$970**

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Specials

DTK 17" Monitor

- DTK 17" Monitor
- 16" Viewable
- 1280 x 1024 Resolution

17"

MODTK001

\$470



DTK 15" Monitor

- DTK 15" Monitor
- 13.8" Viewable
- 1024 x 768

MODTK000

\$299



DIAMOND VIPER V330

- 4MB SGRAM
- Multi Award Winner
- Based on the NVIDIA 128 chipset, this card has super fast 2D/3D
- OEM Card & Drivers
- 20 units only



DCDIA012 **\$185** PCI DCDIA007 **\$165** AGP (OEM)

AWE 64 GOLD SoundCard

- High Quality Wavetable
- Digital output
- Gold Plated RCA
- 10 units only



MMCRE012 **\$255**

MICROSOFT FRONTPAGE 98 UPGRADE

- Professional website creation tool
- Easy and simple to use
- WYSIWYG HTML Editor
- Microsoft Personal Web Server inc

FRONTPAGE
98 UPGRADE

SWMST020 **\$75**

CARRY BAG

- Notebook and Printer Compartments
- Professional Style
- Durable & easy to carry



MSGEN004 **\$75**

AMD K6-2 300 + Chaintech Mainboard COMBO

The Awesome CT Motherboard & AMD K62 are bundled together

- AMD K6-2 300Mhz with 3D-NOW
- Chaintech 5AGM2 Mainboard
- Accelerated Graphic Port (AGP)
- Supports 100Mhz Bus Speed
- Life-like images & graphics
- Big screen sound & video
- Applications will fly!



MSSPE000 **\$399**

Upgrade to Intel Celeron today!

Upgrade Pack includes :
Intel Celeron Processor 300Mhz
DTK EX Mainboard
ESS Sound Card
Deluxe Medium Tower Case



MSSPE001 **\$499**

Cases & APC UPS



Adelong Computers



ADE FILE SERVER CASE AT/ATX

Features

- 2 x 300W Redundant Power Supplies
- 7 x 5 1/4" & 2 x 3 1/2" Bays

CAADE013

\$975

ADE DELUXE AT/ATX MID CASE

W: 192mm
D: 430mm
H: 540mm

CAADE004

\$155



ADE DELUXE AT/ATX MID CASE

W: 190mm
D: 425mm
H: 475mm

CAADE009

\$135

HOT

ADE DELUXE AT/ATX DESKTOP CASE

W: 442mm
D: 473mm
H: 155mm

CAADE012

\$135



Power Supplies

Code	Model	Price
PSGEN000	200W AT POWER SUPPLY	\$35
PSGEN002	200W ATX POWER SUPPLY	\$55
PSGEN003	300W ATX POWER SUPPLY	\$99

Printer Switch

Connect several computers to a single printer.

Code	Model	Price
DSADE007	4 Way Printer Switch	\$39
DSADE021	2 Way Printer Switch	\$25

Power Supplies

Code	Model	Price
DSADE024	EH-132, Portable 3.5" HD caddy which plugs straight into the parallel port of your computer. 40MB - 8.4GB limit.	\$165
DSADE025	EH-100, Portable 3.5"/2.5" HD caddy which plugs straight into the parallel port of your computer. 40MB - 8.4GB limit.	\$145

SCSI/Parallel External Cases

Code	Model	Price
CAADE007	External SCSI Case	\$150
CAADE021	External IDE Case Interface through parallel port	\$155

APC "Industry standard reliable & affordable backup power solution"

Back-UPS - Best Value power protection for your PC

- Compact Design
- Protect your PC, Monitor, Laser printer with 1 device
- Full-time EMI/RFI filters for noise filtration
- Lightning and surge suppression to protect your hardware
- Support for up to 4 Devices

Code	Description	Price
PSAPC008	Back-UPS 300VA	\$299
PSAPC000	Back-UPS 500VA	\$285
PSAPC009	Back-UPS 650VA	\$429



Back-UPS Pro-Performance power protection for servers and workstations

- Instantaneous Backup Power beats blackouts and brownouts
- Network-grade Line Conditioning prevents glitches for 10Base-T
- Test Switch for ongoing peace of mind
- Automatic Voltage Regulation (AVR) provides true brownout and over voltage correction
- Advanced Warning Diagnostics prevent downtime

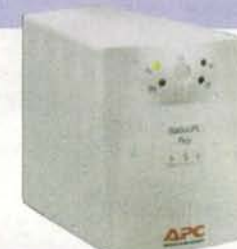
Code	Description	Price
PSAPC001	Back-UPS Pro 420VA	\$469
PSAPC002	Back-UPS Pro 650VA	\$629
PSAPC007	Back-UPS Pro 1000VA	\$1065



Smart-UPS - Power Management for advanced networks

- Site-wiring fault indicator
- Full-time Surge Suppression and Noise Isolation
- User replaceable, hot swappable batteries
- Software configurable features, data logging on 1000/700 model

Code	Description	Price
PSAPC010	Smart-UPS 420VA	\$509
PSAPC011	Smart-UPS 650VA	\$650
PSAPC003	Smart-UPS 700VA	\$970
PSAPC005	Smart-UPS 1000VA	\$1415



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Software




Microsoft Office 97 Value Pack

- Microsoft Office 97
- World Atlas
- Norton AntiVirus
- IntelliMouse
- Publisher 98
- Money 98
- Greetings Workshop

SWMST043 **\$610**

Microsoft	Code	Price
Windows 98 Full	SWMST070	\$275
Windows 98 Upgrade Plus 98	SWMST069	\$138
	SWMST072	\$55
Windows NT Workstation 4.0	SWMST003	\$499
Windows NT Workstation 4.0 Upg	SWMST004	\$249
Windows NT Server 4.0 + 5 User	SWMST048	\$1295
Office Standard 97	SWMST005	\$755
Office Standard 97 Upgrade	SWMST006	\$409
Office Professional 97	SWMST007	\$895
Office Professional 97 Upgrade	SWMST008	\$525
Office Value Pack	SWMST043	\$610

	Code	Price
Frontpage 98	SWMST020	\$165
Frontpage 98 Upgrade	SWMST021	\$75
Project 98	SWMST044	\$759
Project 98 Upgrade	SWMST045	\$315
Visual Basic 6.0 Standard	SWMST065	\$157
Visual Basic 6.0 Pro	SWMST063	\$835
Visual Basic 6.0 Pro Upgrade	SWMST064	\$415
Visual C++ 6.0 Standard	SWMST065	\$155
Visual C++ 6.0 Pro	SWMST024	\$829
Visual C++ 6.0 Upgrade	SWMST066	\$415
Visual J++ 6.0	SWMST023	\$152



Dragon Point & Speak

Now, you don't have to type!

Speech recognition made easy!

Dragon Point and Speak

Just talk naturally, your words immediately appear into email - program, word processing applications and more!

SWEAS012 **\$155**

Dragon Naturally Speaking Preferred

Continuous Speech Recognition

- True Continuous Speech
- Immediate Recognition
- Even Higher Accuracy
- Use with virtually any Windows application
- Integrated with Microsoft® Word 97 and Corel® Wordperfect® 8
- Natural language commands™
- New, larger vocabulary
- Text-To-Speech
- Dictation Playback
- Learns your voice
- Hands-free editing
- Text shorthands
- Dictate on the move

SWEAS003 **\$329**

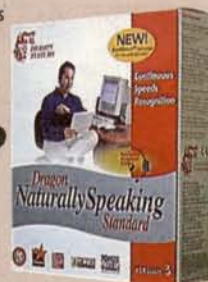


Dragon Naturally Speaking Standard

The fastest way to put thoughts on paper!

- True Continuous Speech
- Immediate Recognition
- Even Higher Accuracy
- Use with virtually any Windows application
- Integrated with Microsoft® Word 97 and Corel® Wordperfect® 8
- Natural language commands™
- New, larger vocabulary
- Learns your voice
- Hands-free editing
- Text shorthands

SWEAS004 **\$229**



Symantec	Code	Price
WinFax Pro 9.0	SWSYM003	\$145
pcAnywhere 8.0	SWSYM004	\$195
Norton AntiVirus	SWSYM007	\$87
Norton SystemWorks		\$190
Norton Utilities Gold	SWSYM008	\$104
MYOB		
MYOB Accounting 8.0	SWMY0001	\$327
MYOB Accounting 8.0 + Payroll	SWMY0002	\$479
MYOB Premier 3 user	SWMY0003	\$875
POWERQUEST PARTITION MAGIC	SWPOW001	\$95

POWERQUEST DRIVE IMAGE	SWPOW002	\$109
Quarterdeck		
QUARTERDECK REALHELP EXTRA STRENGTH	SWQUA000	89.00
QUARTERDECK CLEAN SWEEP EXTRA STRENGTH	SWQUA001	85.00
QUARTERDECK PARTITION IT EXTRA STRENGTH	SWQUA002	99.00
QUARTERDECK VIRUS SWEEP EXTRA STRENGTH	SWQUA003	75.00
QUARTERDECK DISK CLONE	SWQUA004	75.00
Linux		
LINUX Distribution 6CD Set (Includes Debian, Slackware, Redhat)	SWGEN001	\$45

Check2000

Greenwich Mean Time



Adelong Computers

Ensure that your software and hardware is ready for the millenium with **CHECK 2000**



CHECK2000 PC

\$77

SWGREG00

Check2000 products suite detects the five "at risk" layers in PCs to help users and businesses fully understand the issues of the Millenium Bug. These five layers are:

1. Hardware BIOS
2. Operating System
3. Applications
4. User Data
5. Data Exchange

Check2000 PC address layers 1-3. Checks and corrects 98% of BIOS faults and analyzes the operating system and applications to determine which elements are at risk. Check2000PC also advises on how to resolve these issues.

Check2000 PC Deluxe addresses all 5 layers. All user data is analyzed including spreadsheets and databases to ensure that all individual fields and cells are reported. Check2000 PC Deluxe goes further into advising on how to correct these problems.



CHECK2000 PC Deluxe

\$89

SWGREG01



CHECK2000
Client/Server

\$425

SWGREG02

Check2000 Client Server allows network-central deployment of the tools for checking all 5 layers and provides advise on correcting problems at each layer. Reports can be generated detailing where the millenium bug problems are, hence allows for a structured and risk-based approach to resolving these issues.

Call for additional licenses

" DONT LET THE YEAR 2000 BUG AFFECT YOUR BUSINESS"

What is the Year 2000 or Millenium Bug?

The Year 2000 bug is a result of storing the year date as a 2 digit number instead of 4. Hence when we move into the Year 2000, the year date will click back to 00, causing an array of problems for hardware and software. However with Check2000 you can be alerted of your problems today, so that your business can be rid of all bugs before its too late.

II TODAY CHECK2000
IS ESTABLISHED AS THE STANDARD BY
WHICH OTHER YEAR 2000 PRODUCTS
ARE MEASURED"
Microsoft Y2K
Resource
Centre

Sales staff are available (est) 9am-6pm Monday to Friday, 10am-4pm Saturday
Technical Support (5 Days a week 9am-6pm) Phone (02) 8344 3160



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Fix 2000

Your PC on 1st Jan. 2000?



Year 2000 fix!!!

Software
\$99
SWFIX001

fix 2000
the millennium answer

Brilliantly Simple!

At the start of the year 2000, your PC's system clock may revert to the year 1900 because any one of the several clocks onboard are using simple 2-digit years. Year 2000 may be the year that never happens! The result is many programs malfunctioning or not operating at all. Saving you hours of time, fix2000 is the easiest and fastest solution available.

SYSTEM REQUIREMENTS

- **fix2000** Diagnostics Boot Disk will run on any PC from 286 level up, including PS/2 machines, running either DOS/Windows 3.x; or Windows 95/98/NT.
- **fix2000** hardware board requires an ISA slot, and is operating system independent.
- **fix2000** software runs under DOS / Windows 95/98/NT.

Software Repair Version

- **fix 2000** Diagnostic boot disk plus the software date interception system

Hardware Repair Version

- **fix 2000** Diagnostic boot disk plus the plug-in ISA hardware board date interception system



\$185
SWFIX000

Test + Fix

Use fix 2000 Diagnostic to identify a problem, and fix 2000 Repair to correct it!

Most software reads the Operating Systems clock, and some read the lower level BIOS clock, but ALL may be forced to read the base-level CMOS clock if system resources are busy - such as when several programs are open at one time.

Many Year 2000 diagnostic tools **DO NOT** check the base-level CMOS clock!

If it is not compliant, then the probability that your programs will receive an incorrect date from your system is **extremely high!**

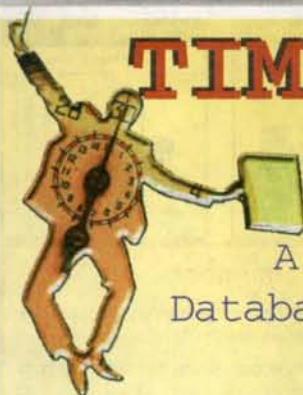
...maybe not on the 1st January 2000, but certainly sometime after!

Contact Pro

ContractPro



Adelony Computers



TIME TO TAKE CHARGE!

With ContractPro

A ready to Go Time- Billing Database For Microsoft Office Pro and Access 97+

SWCON000
\$495

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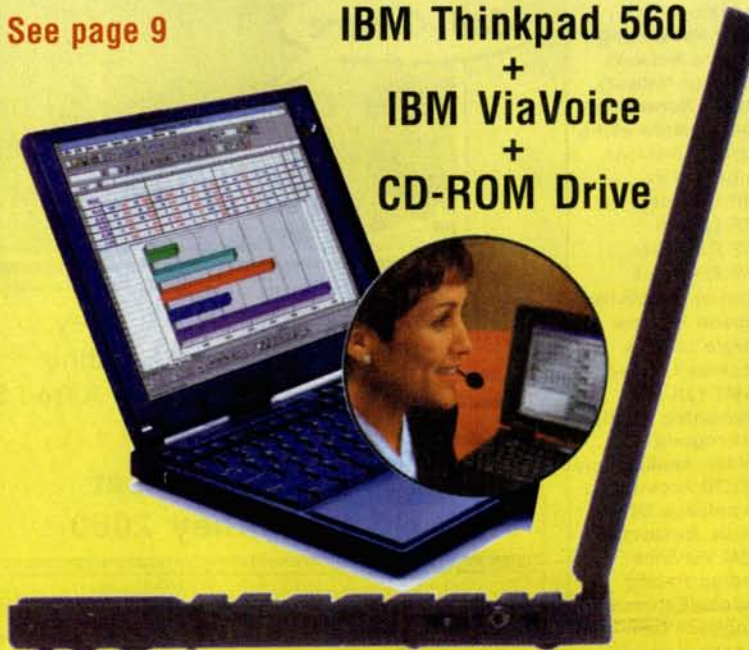
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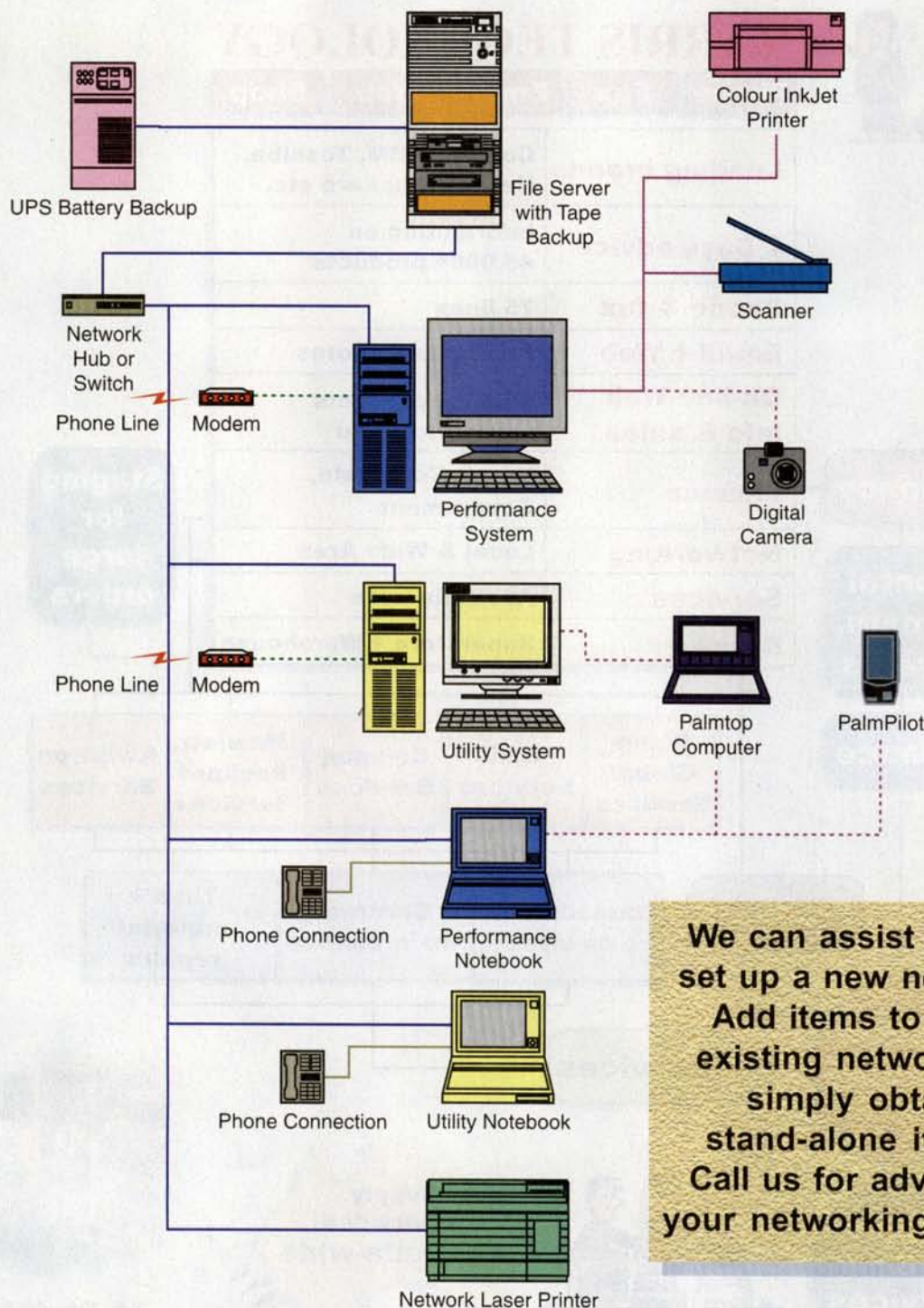
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Ask about Windows NT versions of the Tecra 8000 range

*See back page for rental details

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6

Toshiba Features 	Portégé 320CT	Satellite 4000CDS	Satellite 4000CDT	Portégé 7010CT
Intel Pentium®	266 MMX	PII 233 MMX	PII 233 MMX	PII 300 MMX
RAM Std/Max	32/96 MB	32/160 MB	32/160 MB	32/160 MB
Hard Disk	3.8GB	3.8GB	3.8GB	4.1GB
Screen	10.4" TFT	12.1" DSTN	12.1" TFT	12.1" TFT
Display	1024 x 600	800 x 600	800 x 600	800 x 600
CD-ROM	Optional	24x max.	24x max.	No
Mic & Spkr	Yes	Speakers	Speakers	Yes
Battery Life*	2.5+ hours	2.5+ hours	2.5+ hours	2.7+ hours
Port replicator	Optional	No	No	Optional
Select bay	No	No	No	No
DVD capable	Yes	No	No	Yes
Weight	1.7 kg	3 kg	3 kg	1.9 kg
Warranty	3 Years	1 Year	1 Year	3 Years
Rental 3 Yrs T.A.P.**	\$31.24/wk*	\$26.49/wk*	\$31.24/wk*	\$54.05/wk*
Inc Tax	\$3,998	\$3,390	\$3,999	\$7,399
Part number	(58564)	(69773)	(69774)	(69849)



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Toshiba Features 	Tecra 8000 233	Tecra 8000 233	Tecra 8000 266	Tecra 8000 300
Intel Pentium®	PII 233 MMX	PII 233 MMX	PII 266 MMX	PII 300 MMX
RAM Std/Max	32/256 MB	32/256 MB	64/256 MB	64/256 MB
Hard Disk	3.8GB	3.8GB	6GB	7.6GB
Screen	12.1" DSTN	12.1" TFT	13.3" TFT	14.1" TFT
Display	800 x 600	800 x 600	1024 x 768	1024 x 768
CD-ROM	24x max.	24x max.	24x max.	24x max.
Mic & Spkr	Yes	Yes	Yes	Yes
Battery Life*	3.5+ hours	3.5+ hours	3.5+ hours	3.5+ hours
Port replicator	Optional	Optional	Optional	Optional
Select bay	Yes	Yes	Yes	Yes
DVD capable	Yes	Yes	Yes	Yes
Weight	3 kg	3 kg	3 kg	2.9 kg
Warranty	3 Years	3 Years	3 Years	3 Years
Rental 3 Yrs T.A.P.**	\$31.23/wk*	\$39.03/wk*	\$45.94/wk*	\$60.84/wk*
Inc Tax	\$3,997	\$4,995	\$6,279	\$8,328
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Black
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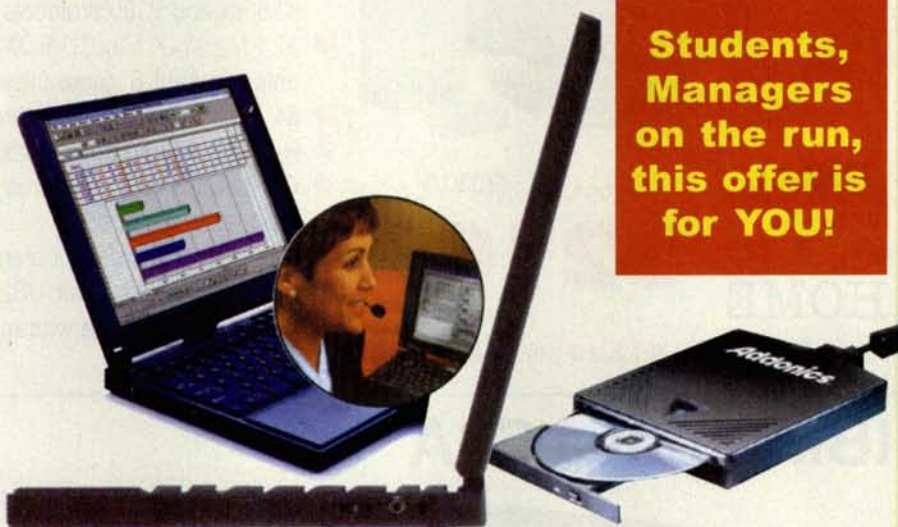
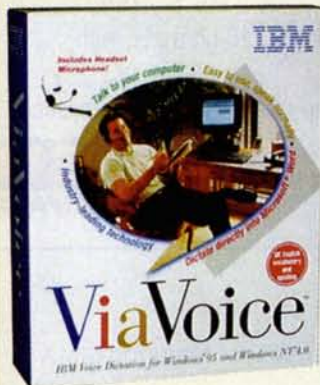
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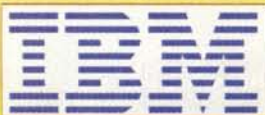
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- 2 USB ports, 2 high speed serial ports, high speed parallel port
- An Accelerated Graphics Port (AGP) 4MB SGRAM
- Includes Lotus Domino 4.6 single processor edition ServerGuide (Including 1x NetFinity Manager & 2x NetFinity Services)
- 32X IDE CD-ROM and 1.44MB diskette drive
- 3 Year-On-Site limited warranty

847620U

Netfinity features

The Netfinity Servers ship complete with keyboard, mouse and NIC. The 5500 has Integrated RAID support for 0, 1 or 5. Free 90 day startup support, 3 year limited on-site warranty.

Netfinity options

IBM
Ultrawide
SCSI HDD
Hot-Swap
4.51GB

\$1,649

(49682)

9.1GB

\$3,353

(65982)

IBM
12/24GB
DAT Tape
Backup

\$2,499

(52388)

Netfinity⁵⁵⁰⁰ File Server

(62174)

\$10,938



- 400MHz Pentium II processor with 512KB ECC L2 Cache
1 or 2 processors, upgradeable to Pentium® II Xeon
- 128MB RAM standard, maximum 1GB
- Dual Channel Wide Ultra SCSI RAID (IBM ServeRAID II on planar) and EIDE (on planar), 0MB installed.
- Maximum storage capacity: 54.6GB
- 6 x 32bit, full size, PCI slots (4 hot swap) 1 x F.S. ISA
- CD-ROM 32X maximum
- 10/100 Network interface: Ethernet-Integrated
- Other features: Dial-in for control/monitoring/remote management (Modem required).
- Dial-out for alert notifications
- Remote POST Control
- Temperature and voltage monitoring

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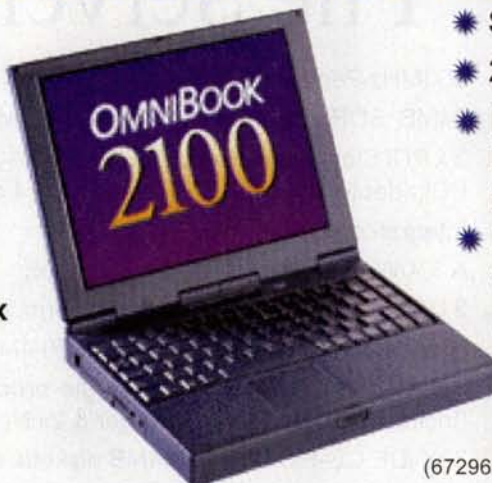
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HP Notebook Computers

HP OmniBook 2100 Notebook

- ★ 233 MHz Intel Pentium® II CPU
- ★ 32MB RAM Expandable to 96
- ★ 4GB Hard Disk
- ★ 12.1" Active Matrix Display
- ★ USB Ready
- ★ Windows 95



- ★ SoundBlaster Pro audio
- ★ 24 x CD-ROM
- ★ Fully DMI Compliant/full Management software included
- ★ Power Management & Cardbus support under NT

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\$36.50/Week

(67296)

(67297)	PII 233MHz processor	★	4.0GB HDD	★	Windows NT	\$5,239
(67298)	PII 266MHz processor	★	4.0GB HDD	★	Windows NT	\$5,749
(67299)	PII 266MHz processor	★	4.0GB HDD	★	Windows 95	\$5,569

HP 620LX Colour PalmTop PC



\$1,539

(56366)



HP 620LX Palmtop PC
with 256 colour screen

Wide, backlit
display

A bright, 256-colour with 640 x 240 pixel display, delivers unmatched readability in any light. Handheld full colour palmtop. Windows® CE 2.0. Pocket versions of Microsoft Word, Excel, Outlook and PowerPoint. Contains a 32-bit RISC processor running at 75MHz, 16MB RAM (user UG), and 10MB ROM (user UG), backlit QWERTY keyboard, Receive and send faxes, voice recording, email. Greater productivity for mobile professionals. Battery life: 12hrs, 3-4x less with Internet access.

Accessories



Docking
Cradle
(56361)
\$76



Leather
Case
(63469)
\$157



Spare AC
Adapter
(56360)
\$88

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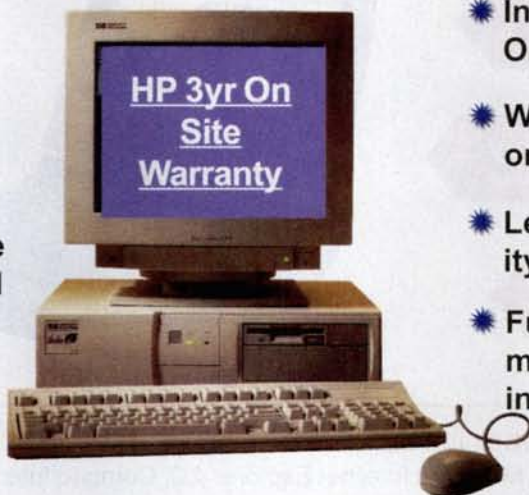
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Part no	Model	CPU	HDD	RAM	OS	NIC	Mon	Price
(67284)	Vectra VE/7	CeIA 300MHz	3.2GB	32MB	Win95	N	15"	\$2,392
(67276)	Vectra VE/7	CeIA 300MHz	3.2GB	32MB	Win95	Y	15"	\$2,497
(22612)	Vectra VE/8	PII/350MHz	4.3GB	64MB	Win95	NO	15"	\$3,792
(63736)	Vectra VL/8	PII/400MHz	6.4GB	64MB	Win95	NO	15"	\$4,228

Hewlett-Packard Vectra VE/8 Pentium® II Power

PII 400MHz Processor with
3.2GB Ultra ATA Hard Disk
Drive, 32MB RAM 10/100TX NIC

(67278 + 42745 15" Monitor)

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\$439
(55567)

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\$468
(42745)

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\$1,049
(48842)

21" monitor
\$2,899
(40886)

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For Vectra.
32x max speed
\$288
(66045)

COMPAQ

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Presario Notebook Computers

Compaq Presario 1240 Notebook

266MHz MMX CPU

\$4,250

(68265)

32MB RAM

(Expandable to 96Mb)

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(High Performance Addressing)

2.0 MB Integrated
Video RAM

56Kbps DataFax
Modem

JBL Pro Audio
System

3.2 GB Hard
Disk Drive

24x
CD-ROM



Software included with Compaq Presario Notebooks:

Microsoft Windows® 98, Microsoft Internet Explorer 4.0, Compaq Internet Set-up, Compaq Selective Quick Restore, Microsoft Works 4.0a, Quicken Standard (v6.0), Microsoft Encarta Encyclopedia 98, Moto Racer (MMX), Microsoft Soccer, McAfee AntiVirus

Armada 1700 Notebooks



(65049)

\$4,953

Intel
Pentium® II

233MHz

32MB RAM

4GB HDD

Features the same "All-in-one" functionality you've come to expect from a Compaq Armada Notebook. Intel Pentium® II CPU 233MHz, 12.1" Active TFT screen with 64-bit graphics accelerator, 32MB SDRAM expandable to 160MB, 4GB SMART HDD, integrated FDD, HDD, 24x CD-ROM, AC Adapter and 56KFlex Data Fax Modem (upgradable to V.90).

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266MHz model
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Please see the Web Direct Link or call us for pricing and availability of RAM upgrades for the Compaq Presario series.

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Graphics with 4MB

Windows® 95 or Windows® NT

From

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(70279 + 57596)

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Compaq Deskpro EP Systems with Intel Pentium® II Processor

Win 95

Part	MHz	RAM	HDD	\$\$
62926	300	32	3.2	2,192
62928	333	32	3.2	2,372
57596	14" Compaq Monitor			380

Win NT

Part	MHz	RAM	HDD	\$\$
66859	350	64	6.4	2,920
66857	400	64	6.4	3,464
57597	15" Compaq Monitor			478

COMPAQ Deskpro EN

(57596)



(62828)

- Pentium® II 333MHz
- 32MB SDRAM, 512KB Cache
- 3.2GB Ultra ATA Drives
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- 3.5" 1.44MB Diskette
- ATI Rage Pro AGP 1X Graphics
- 4MB SGRAM
- Microsoft Windows® 95

\$3,956 with 14" Monitor

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Part no.	Type	CPU	RAM	HDD	\$\$
(69546)	Celeron	300MHz	32MB	3.2GB	2,425
(62828)	P-II	333MHz	32MB	3.2GB	2,576
(62829)	P-II	350MHz	64MB	6.4GB	3,122
(62831)	P-II	400MHz	64MB	6.4GB	3,655

Please note, prices above do not include monitor.

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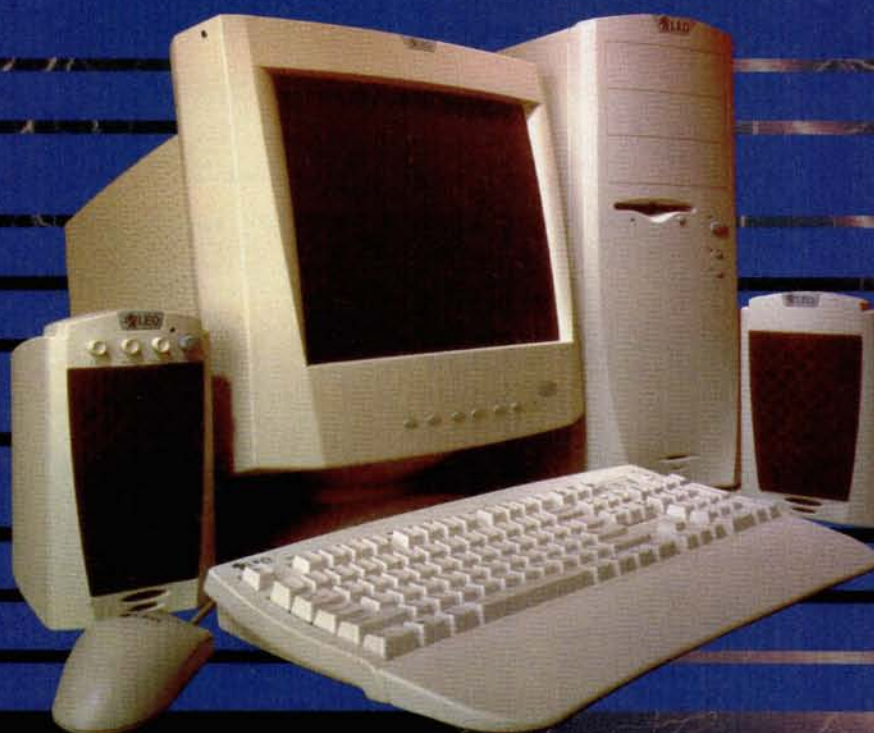
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(69511 +69183)

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Video Card

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Microsoft Windows® 98

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32x E-IDE CD-ROM drive

2D/3D Diamond Stealth II G460 Video Card - 8MB AGP

2x USB connectors

Microsoft Windows® 98

Lotus SmartSuite 97

* Please see
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for details on
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NETWORKS

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Out of the box, on to the Internet

Cobalt Qube



(67317 & 67318)

The hottest trend in business today is the Internet, and you can have it all: the e-mail, the web browsing, and the file transfers, with the Cobalt Qube Microserver. Even better, you don't need a lot of real estate, you could fit the Cobalt Qube **on this sheet of paper!**

The Cobalt Qube is a **complete, turn-key Internet/intranet server** right out of the box. It's pre-configured for web publishing, e-mail, FTP and file transfer, private discussion groups, search capabilities and more.

But a small footprint doesn't mean small impact. A single Cobalt Qube can put hundreds of people on-line. One Cobalt Qube can deliver capacities like these - every day:

- 140,000 e-mail messages
- 50,000 file transfers
- 250,000 web page requests

Open standards, Linux Operating System, Apache web server, CGI and Perl scripting and more.

The multi award-winning Cobalt Qube can be set-up in around 15 minutes.

It's highly scalable, you can afford to grow with it too. How can you not afford to have at least one Cobalt Qube?

Cobalt Qube 2.1GB HDD, 16MB RAM **\$2,748**

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Cobalt CacheQube™



(67319)

64MB RAM, 4.5GB Hard disk

\$4,455

Even if you have a network based on high-speed routers and switches with fast access to the web, you probably still experience delays when requesting web pages or other objects. That's because the web is vast and cluttered with lots of traffic. Fortunately, there's a simple, affordable solution. The Cobalt CacheQube™ eliminates the need to constantly increase band-

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ISPs By deploying caching at Points of Presence (POPs), ISPs can reduce bandwidth requirements, scale their existing networks, and provide customers with faster web access, all without a major investment.

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The Cobalt RaQ™



Sinfully easy, dedicated hosting

The cobalt RaQ microserver makes dedicated hosting simple and practical. It comes pre-configured with all the hardware and software needed to support high-speed web hosting and other services, and sets up in under 15 minutes. Give it power and an ethernet connection and when that new client calls for Internet services, you simply activate an assigned Cobalt RaQ directly from an administrative desktop browser. Remotely assign a domain name and the service is on-line and ready to go by the time the client's credit is authorised. It couldn't be any easier for you or your client. Fit up to 40 in a standard rack. Each provides e-mail, web and file transfers, CGI and Perl support. Clients create their own content, administer their own e-mail - including creating accounts and auto-forwarding messages - and backup their systems remotely.

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Store approximately:

- 6000 addresses
- 5 years of appointments (approximately 3000)
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Organiser Applications :

Date Book, Address Book, Mail, To Do List, Memo Pad, Expense, Calculator, Security, Games, HotSync.

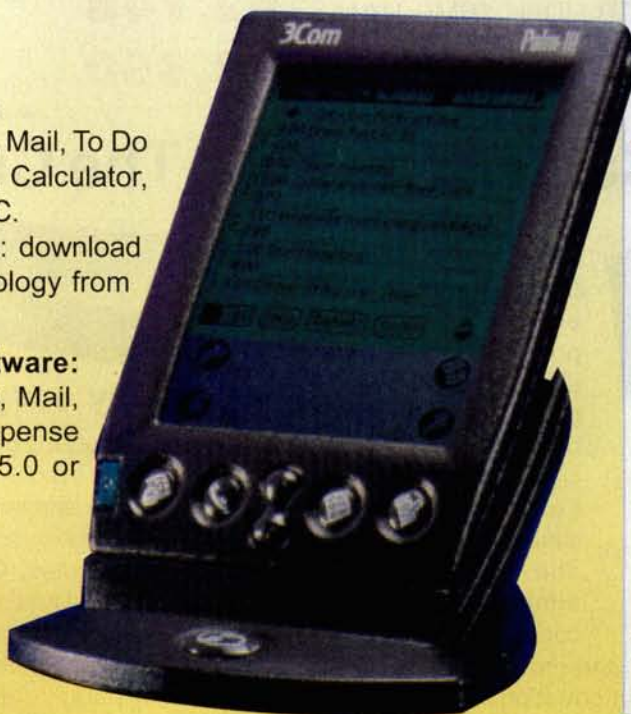
For remote synchronisation: download Enhanced HotSync technology from www.palm.com

Desktop Organiser Software:

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(66428)

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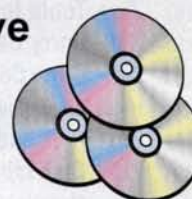
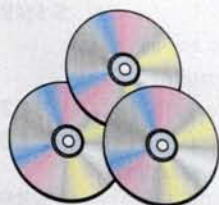
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Power Back Up = Power Protection

PREVENT DATA LOSS!

Power problems wreak havoc on today's multitasking networked or stand-alone PCs. If you don't have enough power, your computer will crash before safe shutdown, and crashes mean lost data. A UPS (uninterruptible power supply) is designed to **keep your PC working when the mains power fails**. Long enough, that is, to save your important files and shut down your PC properly. It instantly switches your computer to emergency battery backup power and allows you to work through brief power outages without data loss or downtime. High-performance surge suppression protects your computer from electrical noise and damaging power surges - even lightning.

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- **Audible Alarms.** If the unit is on battery, or if the battery is low, or even if there is an overload condition, APC Back-UPS Pro will let you know with an audible alarm, so you know when to save files and shut down.
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- **User replaceable, hot swappable batteries.**
- **Universal Hardware Compatibility.**

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For small office servers

Affordable power protection for entry level departmental LAN, small office, and home office servers

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- Two year warranty



APC Smart-UPS 620 (67198)	APC Smart-UPS 420 (67199)
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ST310240A
10Gigabyte

\$535

(66358)

Tape Back Up Kits

- ◆ Travan TR-4 Internal Tape Back-up kits
- ◆ 4 Gig native up to 8 Gig with software compression.
- ◆ Includes software for Win3.x, Win 95 & NT Workstation
- ◆ 2 Year warranty
- ◆ Includes 1 x TR-4 Tapes



**Unit is pictured installed into an external casing

STT28000A-RFT
Internal
SCSI
(56141)

\$595

STT28000N-RFT
Internal
IDE
(56140)

\$628

Seagate Software

Small Business Server Suite V7.0 for Windows® NT



Features:

- Fully integrated with the Microsoft BackOffice Small Business Server.
- Integrated backup, restore, disaster recovery and virus cleaning.
- Unattended operation any time of day or night.
- Easy to use Wizards.
- Single step online backup of Exchange, SQL and the BackOffice Small Business Server.



(17405)

\$930

V7.2
For
Windows®
NT

Enterprise
Edition
(51720)

\$1,879

Single
Server
Edition
(69759)

\$859

December

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or T/T. Call for details.

Data Fax Modems & Ethernet Cards

RealPort™ Integrated PC Card Family

Features and Benefits: • 16-bit and 32-bit interfaces available • Integrated Ethernet LAN, modem, and telephone handset pass-thru connectors provide reliable, cable-free connectivity • Uses standard RJ-45 Ethernet and RJ-11 telephone cords • Digital Shield™ protects modem from high-current digital phone lines • GlobalACCESS™: one card for worldwide use • GSM and AMPS-cellular capable • ISDN capable • Connects notebooks to either 10Mbps or 100Mbps Ethernet networks • Supports modem speeds up to 56K

Xircom RealPort Ethernet 10/100 + Modem 56K

Lucent Technologies
Bell Labs Innovations



(61795) **\$699**

The integrated PC Card: nothing to break, nothing to lose

The first 16-bit integrated PC card with built-in connector system. It has all the features you need to connect to information in the office or on the road, anywhere in the world. One PC Card- no custom cables to lose, no pop-out jacks to snap and leave you stranded. All you need are standard Ethernet and telephone connectors, and you're ready to access information anytime, anywhere.



1. Slide into PC Card slot



2. Plug in standard LAN & phone connectors



3. Ready to access information in the office or on the road

Save money, ask about Xircom RealPort multi-packs



(55838)

MiniDock™ Connector System

Combines both LAN and modem connectors in a single, durable device, enabling you to connect easily and reliably when accessing data from corporate networks, the Internet and other online services. It also features convenient LEDs displaying modem and network status information at a glance.



\$65

Xircom RealPort Modem 56 GlobalACCESS

With RealPort Integrated PC Cards, there are no cables to lose or moving parts to break. Lowest cost of ownership: integrated PC Cards reduce support calls, user down time and eliminate cable replacement. Flash ROM-upgradable to 56K (V.90) at no charge.



(68724) **\$355**

Xircom RealPort Ethernet 10/100

RealPort Integrated PC Card LAN solutions offer mobile users high-performance 10Mbps and 100Mbps Ethernet connectivity for the most reliable access to information while in the office. • Robust integrated connectors • Easy to use • Longer battery life • High performance



(67216) **\$330**

Xircom RealPort CardBus Modem 56 GlobalACCESS

RealPort Integrated PC Card Modem solutions offer mobile users high-speed 56K modem, GSM, AMPS cellular and ISDN functionality. GlobalACCESS™ features make it easy to connect to information from any location, anywhere in the world.



(70228) **\$359**

CreditCard 56K modem



(54763)

\$338

CreditCard 10/100 Upgradable



(27310) From

\$246 UTP

10Mbps Pocket Ethernet



(10257) From

\$615 Coax

Creditcard 10/100BTX Ethernet + 56K modem



(56359)

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CardBus 10/100 Ethernet



(38605)

\$365

Credit Card GSM Modem



(55026)

\$394

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NetComm

ROADSTER II 56

USB

DESIGNED FOR WINDOWS® 98



(63379)

\$289



Roadster II 56 USB modem - utilising USB technology, and the capability to connect to both K56flex and V.90 modems, now lets you surf the Net at speeds up to 56,000bps, without the bottlenecks of a normal serial port. The modem features full voice capability with voicemail and handsfree speakerphone operation (headset included!).

With inbuilt SVD technology you can even talk and send data at the same time over the same phone line.



- USB & phone cable
- Fax/data, voice and Internet software (Windows® 95 and 98)
- Modem is powered by USB- no need for bulky power pack!
- WinFax Pro 8.0 including Talkworks voice messaging software

Save when you purchase a Toshiba Notebook and Netcomm Modem together. For more details call (02) 9925 9925

Card Modem
56 KFlex
(52694)



\$335

CardCombo
56 Modem
Ethernet
(52693)



\$379

NetComm

56 GLOBAL PC CARD MODEM

K56Flex with FLASH upgradable to new ITU standard V.90 via download from website.

Drivers for Windows® 95/98, Windows® NT.

GSM ready (GSM connection kits sold separately)

Approved in 24 countries

Call for GSM Connection kits

Nokia Approved

Data Transmits @ 56,000bps



(67208)

\$399

Netcomm Communications CD including WinFax Pro (OEM)

The Netcomm CardModem56 Global gives the world traveller the freedom of data connection either through a Land line or Mobile phone (GSM). With data download speeds of up to a scorching 56,000bps as well as the ability to send and receive faxes of up to 14,400bps. So no matter where you are - in a multitude of countries around the world, between your laptop, your mobile phone and the Netcomm CardModem56 Global, you'll always be in touch.

The Netcomm CardModem56 Global is a complete hardware and software solution for easy connection to the Internet from over 200 countries world wide.



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Drive Super-Highway 56

Wave SP 56KFlex V.90

The Wave SP 56KFlex Modem lets you fly through the Internet faster than ever before, as much as twice as fast as previous modems.



\$270

(67209)

Includes FREE Camera



- K56Flex modem
- V.90, comes with disposable 35mm camera
- Smart answer phone
- Hands free full duplex speaker phone
- 3 Year parts & labour warranty, with lifetime support
- Full duplex speakerphone with echo cancellation
- Data upstream at 33.6, downstream at 55.6 Kbps
- SVD capable

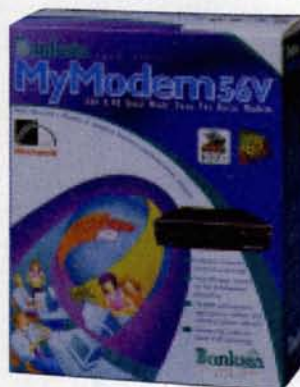
Banksia MyModem 56V

Brand new from Banksia is the MyModem 56, V.90 ready modem. Turn the Internet into a whole new experience as you witness the speed of this modem capturing data.

- 56K V.90 dual mode data fax voice modem
- Data transfer upstream at 33.6Kbps, downstream at 55.6 Kbps.
- 2 Year parts & labour warranty

\$236

(62589)



Banksia Modems

Comm Server
(58577)



\$1,487

WebRamp M3
Modem Router
(52913)



\$759

PCCard56 OR ComboCard56 with Targus Notepac*



\$252

(69375)



\$350

(69464)



- K56flex - 56Kbps download, 33.6Kbps upload
- WinFaxPRO from Symantec
- QuickLink III MessageCentre
- V.42, V.42bis, MNP2-4, MNP5, MNP10
- 14.4Kbps fax Class 1, Group III

The Targus Notepac features a full padded section measuring 14" x 11" x 2.5". An adjustable padded divider separates the computer from a power supply. External gusseted pocket, shock absorbing rubber feet. Valued at \$55

* Available while stock last

- K56flex - 56Kbps download, 33.6Kbps upload
- WinFaxPRO from Symantec
- QuickLink III MessageCentre
- V.42, V.42bis, MNP2-4, MNP5, MNP10
- 14.4Kbps fax Class 1, Group III
- Ethernet 10 Base-T compliant

The people who invented the PC modem

Line
Isolation
Module

\$195
(52856)

Internal 56k
KFlex Data/
Fax

\$212
(47504)

Hayes
Accura
ISDN
Modem



(67190)

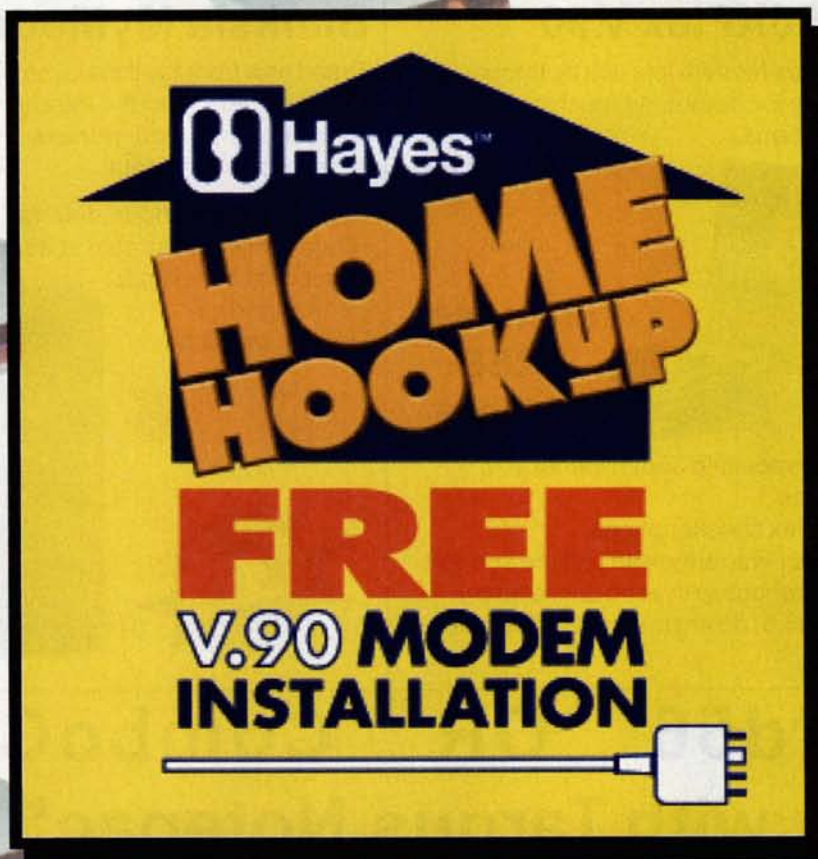
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Hayes
Optima 56K
PC Card



(57493)

\$519



Special Offer!

*Offer valid for the following modems:

Hayes
Accura 56K
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Data/Fax
Modem



(67218)

\$249

Hayes
Accura 56K
Speaker-
phone
External
Modem



(48637)

\$259

- Although installing a modem isn't rocket science it can be a little tricky if you're buying a modem for the first time or if you're not a technical person.
- That's why, when you purchase your new 56K Hayes modem* before 31st December 1998, **it will be installed absolutely free of charge**, by a Hotlinks professional!

Conditions apply. Offer valid in Sydney, Penrith, Newcastle, Wollongong, Canberra, Melbourne, Geelong, Brisbane, Gold Coast, Adelaide, Perth and Hobart only. Must be a stand alone (non-networked) PC with Windows® 95, Windows® 98. Ph 1300 360 270 to arrange installation.



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Intel InBusiness™

Small Business Networking



(58551)

\$819

Intel InBusiness™ Internet Station

- Multiple user Internet Access over a single line
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- InstantIP™ technology saves time and money on Internet addresses
- Supports both analog and ISDN lines
- Two additional ports for "dial out" and "fax out"



(68444)

\$546

Intel InBusiness™ 8-Port 10/100 Hub

- Easily connects devices to create a Fast Ethernet network
- Simple installation, no software required
- 10/100 Auto-sensing each port

NEW



(63213)

\$499

Intel NetportExpress™ 10/100 Print Server 1-port

The Netport Express 10/100 Print Server delivers outstanding performance, anticipating tomorrow's needs by exceeding the demands of today.

- Reliability and performance through Intel® processor technology
- Super low cost
- Intel i486 processor on board

Intel InBusiness™ 5- and 8- Port Hubs



5-port 10mbps
hub: (58547)

\$115

8-port 10mbps
hub: (58548)

\$147

Intel InBusiness™ 8-Port Switch and Switch Plus



8-port 10mbps:
(58552)

\$540

8-port 10mbps
+
2x 10/100
ports:
(58553)

\$719

December

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Fast Inter-office Connections

See pricing lower right.

Options:

Router software for support of more than 30 users, inc IPIX
Upfront \$236
Mthly \$7

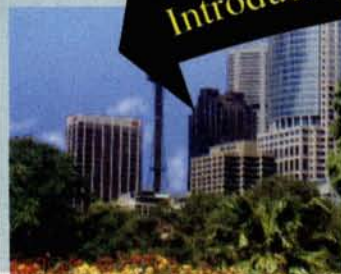
Cisco 771
4 user hub
Inc Mthly Maintenance
Upfront \$156
Mthly \$57

Hub for 4-8 users - Cisco 1502, inc installation & maintenance
Upfront \$633
Mthly \$16

Hub for 8-16 users - Cisco 1516, inc installation & maintenance
Upfront \$1,202
Mthly \$34

Introducing an Easy way to connect your business!

Fractal™ Business Connect for 2 - 5 Offices



Telstra announces Fractal *Business Connect Easy Pack* - a range of office-to-office network packages for businesses wanting to connect 2 to 5 sites. With Fractal *Business Connect Easy Pack* you can improve communications with employees, customers and suppliers, while increasing both productivity and revenues.

In this time of rapid change, you need your network to be a predictable and reliable part of your business - Fractal *Business Connect* is the affordable choice for your business and delivers total ease of ownership.

Telstra's experience is second to none when it comes to data networks and these packages have been designed in a way that's best for performance, reliability and your bottom line. Telstra know what organisations need from their networks and by partnering with Cisco Systems, the world's leading networking vendor, Fractal *Business Connect* delivers all the advantages of a best-of-breed solution.



Key Benefits

- Single point of contact
- Single bill
- Telstra OnRamp ISDN
- Cisco Routers
- Telstra installation
- Telstra support
- Big Pond business option

Example

There are a number of combinations and solutions available. Please call us to determine your specific needs. Here is one common example

Two offices with no Big Pond Internet requirement
Connecting for average of 3 hours per day

	Upfront	Mthly
2 x Cisco Router	\$2,376	\$0
Installation & Monthly access	\$390	\$100
Support - Telstra On Site SBH Next Business day	\$0	\$48
Totals...		
Network ownership costs (Actual)	\$2,766	\$148
Network usage costs - indicative (3 hrs/day)		\$110

Total Annual Costs. Year 1 → \$5,861 • Year 2 → \$3,095 • Year 3 → \$3,095



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Now Networking is Easy!

NETGEAR™ RM356 Router

(70197)

NEW**\$699**

Connect multiple PCs to
the Internet easily

This Netgear router provides shared Internet access in a box. Small offices/home users can connect multiple PCs to the Internet to access email and download information, programs, or games with a single connection, using one ordinary phone line and one Internet Service Provider account.

- Single-box Internet access solution: router + integrated 56K modem + integrated hub
- DHCP server
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- Hi/fn (STAC LZS) compression
- Unlimited PC connections
- Five year warranty
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I'm on my
way to Harris
Technology to get
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NETGEAR™ 10/100 Mbps Switches

(04258) **FS102** 2 port 10/100 switch:**\$399**(53378) **FS104** 4 port 10/100 switch:**\$785**(58009) **FS508** 8 port 10/100 switch:**\$1,785**(60522) **FS516** 16 port 10/100 switch:**\$2,414**

Speed sensing switches, full/half duplex,
easy to install and use.



10Mbps Ethernet Hubs

(53456) **EN104TP** 4 port, slimline, 10baseT**\$ 86**(53455) **EN104** 4 port, slimline, 10baseT, BNC**\$ 124**(53458) **EN108TP** 8 port, slimline, 10baseT**\$ 132**(53457) **EN108** 8 port, slimline, 10baseT, BNC, AUI**\$ 174**(53459) **EN116** 16 port, slimline, 10baseT, BNC, AUI**\$ 292**(17425) **EN516** 16 port, rackmount, 10BT, BNC, AUI**\$ 398**(17435) **EN524** 24 port, rackmount, 10BT, BNC, AUI**\$ 499**

Netgear Dual Speed Hubs

**8 Port Dual Speed
(10/100) Hub Slimline****DS-108** (18755)**\$578****Dual Speed 10Mbps/
100Mbps Hubs stackable****DS-508** (18738) 8-port**\$998****DS-516** (18747) 16-port**\$1,499****DS-524** (69474) 24-port rackm**\$1,999**

NETGEAR Print Servers



PS110 - Two bi-directional
parallel printer ports and 1
autosense 10/100Base-Tx
Ethernet ports. Diagnostic
LEDs. Prints concurrently from NetWare,
Windows for Workgroups, Windows 95,
Windows NT and Unix.

NEW (67226) **\$455**

PS104 - One bi-directional parallel printer port
and four 10Base-T Ethernet ports. Diagnostic
LEDs. Prints concurrently from NetWare,
Windows for Workgroups, Windows 95,
Windows NT and Unix.

NEW (67225) **\$349**

NETGEAR Starter Packs



The ideal network starter kit for Pentium PC's.
Comes complete with two 10/100 NIC's, a
10 mbps 4 port hub, two cat 5 cables and a
network starter guide.

(13277) **\$227**

(67106)

\$349

Fast Ethernet Starter kit including one
NEFE104AU 4 port fast Ethernet hub, two
NEFA310TX Ethernet Interface cards plus
cables, documentation and drivers.

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24
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Adapters

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10Mbps ISA +
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(NE2000
compatible)

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(58728)

FA310
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(Speed
sensing, PnP)

\$86

(53460)

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FA410
PCMCIA
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(60071)

\$246

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3Com OfficeConnect Hubs

Hub TP4

Four 10Base-T ports
(39542)

\$137

Hub 8/TPO

Eight 10Base-T ports
(26769)

\$190

OfficeConnect Fast Ethernet Hubs

Hub TP400

Four shielded 100Base-TX ports
(56400)

\$272

Hub TP800

Eight shielded 100Base-TX ports
(56401)

\$708

Hub TP1200

Twelve shielded 100Base-TX ports
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\$1,059

U.S. Robotics® 56K* Win-modem® Faxmodem for Windows®



(66708)

\$188

Special Offer !

*This offer is for the first 40 buyers of the Sportster Flash only, so hurry!

Buy..

a 3Com U.S. Robotics 56K V.90 Voice Faxmodem..



(61303)

\$245

The 56K V.90 Voice Faxmodem enables an extraordinary increase in the transmission of data over normal telephone lines at the price of a standard modem. Coupled with the added benefit of Personal Voice Mail, a full-duplex speaker phone and fax machine, this is a reliable, easy-to-use, ultra-fast modem in one compact unit.

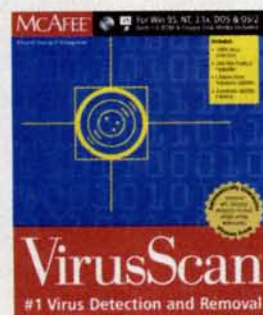
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MCAfee

VirusScan

3.0

worth \$48 !



3Com Megahertz® 10/100 LAN + 56K Modem PC Card

(67217)



\$629

Today's easiest combocard to configure and use, and the future-proof choice for tomorrow

This best-of-breed solution practically sets itself up- including those mind-numbing drivers. It combines the world's leading Ethernet technology and our 3Com Megahertz 56K modem into a single PC Card. It also delivers today's fastest 10 Mbps connections with automatic 100 Mbps network configuration when you're ready. And we offer 56K technology with the V.90 ITU-T standard built-in.

3Com Megahertz® 56K Global Modem PC Card with the V.90 56K standard

(58084)



\$364

Hassle-free access and high-speed downloads anytime, anywhere from any model notebook.

Delivers hassle-free access for global travelers and the V.90 56K standard for downloads up to 56 Kbps worldwide. Features WorldPort™ country selection software to easily configure your modem for use around the world, Intelligent Auto Install for easy, doubt-free installation, and Digital Line Guard to alert you when connecting to potentially damaging digital or PBX lines.

December

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D-Link DP-602 Internet Server

NEW PRODUCT



Connecting your LAN to the Internet is now easier with D-Link's NEW Internet Server

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\$475

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- Dial on Demand
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- 56Kbps modems/128Kbps BRI ISDN TA support
- 2x RS232 COM ports

- Bandwidth doubling through simultaneous use of 2 COM ports
- Firewall protection, PPP security
- Admin through Telnet, Web browsers, Windows based program
- Flash memory for firmware upgrade



(62956)

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DFE-530TX

10/100Mbps Ethernet / Fast Ethernet PCI Adapter

- Single RJ-45 connector autodetects network speed
- 32-bit bus master burst mode removes network bottlenecks
- Ideal for high-power servers and videographic or multimedia stations
- Plug and Play installation



(53599)

\$99

DE-805TP

Ethernet 5-port mini 10Base-T hub "HUBBY"

Pocket-sized portable hub for 10BASE-T, designed especially for small workgroups. Provides 5 twisted-pair ports for 5 users, and can be easily expanded by cascading with another Hubby or another 10BASE-T hub.

More from D-Link:

DFE-908X

10/100Mb 8-port dual speed stackablehub



(60558)

\$687

DES-810 Combo Switch

8x10Base-T & 2x100Base-TX Fast Ethernet switch



(53717)

\$799

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Your ideal first accounting system. Quickly steps you through automating your accounts. Choose from 50 pre-set datafiles - use them as they are, easily modify them to suit your business or create your own. Easily import data from Quicken, Microsoft Money, BestBooks etc. Easy to use - no accounting knowledge needed.

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The ultimate telephone directory on CD-ROM. Includes special search facilities.

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5 products, worth over

\$500 for only..

\$187

(65553)



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(58600)

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M.Y.O.B.

Accounting

Payroll 8

(58594)

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The World's #1 Selling OCR Software

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\$819

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Upgrade OEM (69088) upgrade from any OCR

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Includes PageKeeper Standard

The easiest way to organize and find scanned and electronic documents
Value \$109!

Form Management Software



Accurately turn your paper forms into versatile electronic forms in seconds!

Introducing Omniform Version 3.0. Makes electronic forms so easy to create! Just scan in a paper form, and seconds later, there is the form on your computer screen, ready to be filled out, edited, stored, printed, etc. Or design a whole new form. **Omniform 3.0. The complete forms solution you can use immediately. Features:**

1. **Forms Assistant** - Guides you through the steps of scanning a form to creating new from scratch.
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3. **Tab & Type to fill in the form**
4. **Easily Edit and Modify forms**
5. **Automatically checks spelling and performs calculations** - As you fill in forms Omniform will check and calculate as you go.
6. **Create mailable forms**
7. **Convert other electronic forms into Omniform format**
8. **Shrink page to fit** - Large formatted forms can be scaled down to fit your printer's printable area
9. **Network Sharing** - Multiple Users of Omniform Filler 3.0 can now fill in forms over a network and capture information in central database

Omniform is Caere's award-winning electronic forms solution that converts a paper form into a fully editable electronic form that can be filled out on screen, stored, printed, and electronically distributed. No more filling out forms by hand -- just scan in a form, then fill it out in your computer. Or create new forms from scratch.

Electronic Forms - the easy way
(65467) **\$305**
(70310) **\$132**

Caere Omniform
Caere Omniform Filler



Smart Scanners! Sharp Results!

HP Scanjet 4100C

**The easiest scanner
for home**

- Guided workflow for quick results.
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- Easy to set up and fast operation with USB.
- Resolution: 600dpi Hardware Super Sampling, 1200dpi enhanced.



NEW

(67196)

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**Best productivity
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- Fast scanning
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- Easy to use
- Enhanced Parallel Port
- Resolution: 600dpi Hardware Super Sampling, 1200dpi enhanced.



(56446)

\$465

HP Scanjet 6250C

**Best image quality and
maximum productivity
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- Integrated automatic document feeder for multi-page scanning
- USB/SCSI capable
- Resolution: 1200dpi Hardware Super Sampling, virtually unlimited enhanced resolution



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HP Scanning Technology at a glance

Features of Intelligent Scanning Technology	4100C	5100C	6250C
Push button scanning	✓	✓	✓
Dual image scanning	✓	✓	✓
Auto descreen/deskew	✓	✓	✓
Integrated OCR	✓	✓	✓
36-bit colour image processor	✓	✓	✓
Scan direct to application (drag & drop)	✓	✓	✓
Line art enhancement		✓	✓
Preview outline by region type		✓	✓
Auto page format retention		✓	✓
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Advanced imaging controls			✓
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(56445)

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24ppm mono
6ppm colour
Media size:
A4/letter for
colour.

(70355)

\$13788

HP Laser- Jet 4500

16ppm B/W
4ppm color
32Mb RAM
Standard
HP PCL5/ PS2
(70356)

\$5589

NEW!

HP LaserJet 1100 Printer



(70095)

\$799

The new generation HP LaserJet 1100 series sets another impressive pace, delivering a stunning 8 pages per minute print speed. The 600 dpi print resolution with HP's Resolution Enhancement technology (REt) makes every document more professional. 2MB RAM handles complex documents with ease and lets you return to applications quickly. Network compatibility available. HP's exclusive JetPath technology allows you the flexibility to expand the HP LaserJet 1100 printer into an All-in-One performer when your business needs grow.

If your current
business needs
require the HP
LaserJet 1100
printer with
copying and
scanning
capabilities, move
up to the LaserJet
1100A.

NEW!

HP LaserJet 1100A Printer - Copier - Scanner

The HP LaserJet 1100A redefines performance by offering printing, copying and scanning All-in-One. In addition to crisp, sharp laser printing, you can make laser copies at the touch of a button, even without the PC turned on. Full scanning capability enables you to transform hard-copy documents to electronic images to work with on the desktop, file, or communicate via e-mail and PC fax.

Scan resolution 600dpi enhanced, 300dpi optical.

(70096)

\$976



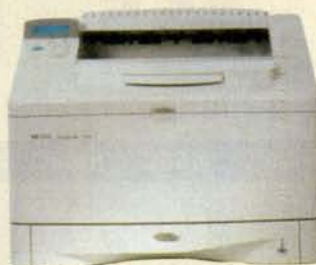
HP LaserJet 4000



- 17ppm engine, 100MHz RISC processor
- HP PCL6 & PostScript level 2
- 600 sheet standard input
- Warm up time less than 15 seconds
- 1200 dpi
- 4MB RAM

From **\$2,239** (54375)

HP LaserJet 5000



- 16ppm engine, 100MHz RISC processor
- HP PCL6 & PostScript Level 2 emulation ensure compatibility
- 1200dpi
- 250-sheet input tray
- 4MB RAM (exp. to 100MB)
- Print size up to 11x17 inches

From **\$2,998** (60548)

HP LaserJet 8000



- 24ppm engine, 133MHz RISC processor
- HP PCL 6 & PostScript Level 2
- Reduced network traffic and faster return-to-application times
- 1200dpi
- Ability to print and duplex up to 11x17 inches
- 16MB RAM (exp. to 192MB)
- 2 x 500-sheet input tray

From **\$4,695** (60551)



Christmas
gift ideas!



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HP DeskJet Printers

Have a look at www.ht.com.au/cat/hp
for HP inkjet papers, transparencies,
inks, toners etc.

HP DeskJet 420C

**Great looking results,
even on plain paper**

- Compact design, small in size
- Up to 3ppm in black
- Helpful onscreen answers to your printing questions
- Reliable as you would expect from a HP product
- Automatically feeds up to 50 sheets of paper
- Optional black-only cartridge for personal projects



NEW

(69548)

★ **\$189**

HP DeskJet 670C



**Incredible printer -
incredible price**

- Dazzling colour, solid black-and-white
- Quick & easy driver installation
- HP's RealLife Imaging System with HP RET (Resolution Enhancement technology)
- HP ColorSmart technology automatically adjusts settings for the best colour
- Black: 600x600dpi, 4ppm
- Colour: 600x300, 1.5ppm

(43013)

★ **\$245**

HP DeskJet 695C

Easy to use - great quality

- HP PhotoREt Technology
- Dual cartridge
- ColorSmart II
- New improved driver - Windows 3x/95/NT 4.0
- Photo capable with optional Photo Head
- New super economy mode
- Black: 600x600dpi, 5ppm
- Colour: 600x300dpi, 1.7ppm



(66260)

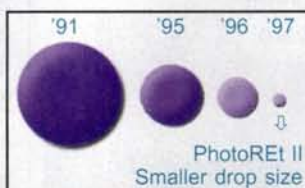
★ **\$290**

What is PhotoREt II ?

Over the last several years, dots per inch (DPI) has become one of the specs people associate with print quality. But higher DPI doesn't necessarily equal better print quality. There are drawbacks to increasing dots per inch, including bigger file size, slower print speed and less control of the ink on plain paper. All those drops of ink can make plain paper wet and wrinkled. But there is an alternative. The new HP printers feature a breakthrough HP technology known as PhotoREt II. It maximizes efficiency of the new HP colour inkjet cartridge to fire ink drops that are 70% smaller than those of previous cartridges, and the smallest dots yet compared to other desktop inkjet printers. It allows the cartridge to place up to 16 drops of ink on a single pixel, producing more colours per printed dot.

What does this mean for your print-outs?

You will get vivid colours, smoother skin tones, less graininess, sharper edges, smoother colour transitions and better image resolution on plain and special paper, without sacrificing print speed.



**PhotoREt II..
Preferred by most
advanced life
forms**



NEW



710C

PhotoREt II
600dpi
6ppm black
3ppm colour

\$437
(68905)



720C

PhotoREt II
600dpi
8ppm black
4ppm colour

\$519
(56299)

NEW



895Cxi

It's fast!

PhotoREt II
Networkable
10ppm black
6ppm colour
**USB &
Parallel**

Call for
pricing or
check Web
Link



1120C

PhotoREt II, A3
Network ready
600dpi
6.5ppm black
4.5ppm colour

\$895
(56298)

December

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35

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The HP "All-in-One" Series

**Hewlett
Packard
ink**

for OfficeJet 590



Black: (21919)

\$54

Colour: (22331)

\$58

for OfficeJet Pro



Black: (22643)

\$60

Colour: (22773)

\$59



**Premium InkJet
Paper 200sheets**

\$45

(10468)



**Premium
Transparency
Film 50 / pack**

\$84

(28130)

**HP Support
Pack 20**

HP provides a
permanent
replacement
unit at the
customer's site
within the next
business day.
For 3 years:

\$218

(21948)

HP OfficeJet Pro 1170C Series

The new OfficeJet 1170C Series is the easy to use All-in-One that provides professional quality and performance for the discerning customer. **Print, copy, scan, all in colour!** The versatile flatbed of the OfficeJet Pro 1170C Series



lets you easily scan and copy a wide variety of documents, pictures, books and other objects. The 1175C model includes integrated PC faxing and has an automatic document feeder to make scanning a multiple page document a breeze.

**Features
PhotoREt II**

From \$1,378
(63098)



HP LaserJet 3100

Printer • Fax • Copier • Scanner

An "All-in-One" device that offers laser printing, business faxing, quality copying, monochrome scanning, and a software suite that includes an easy-to-use desktop interface, PC Fax and Optical Character Recognition (OCR) applications.

Printer: 600x600dpi, 6ppm, 1x 100sheet paper input bin. **Fax:** 6 sec. per page, 175 programmable speed dials, standard, fine & superfine fax resolution. Scanhead fax allows for multitasking. 2MB memory. **Scanner/Copier:** 600dpi enhanced scanning resolution with 256 grey levels, scans up to 6ppm, copies up to 6ppm, reduce to 50%, enlarge to 200%.



(58566)

\$1,378

HP Warranty

The One-Year HP Express Service warranty is for the OfficeJet 590 and 635 only. It minimizes your down time if anything breaks on the OfficeJet Pro. It's designed to keep you productive and give you peace of mind. It includes:

- Free parts, labour and freight
- Free on-site pick-up and drop-off
- HP pays for the fastest shipping feasible within your area

(Warranty for the OfficeJet Pro 1170C Series & LaserJet 3100 is 1 year, parts and labour, return to Hewlett-Packard)

HP OfficeJet 635

**Colour printer • Colour copier
• Colour scanner • Fax**

Printer: 600x600dpi / 5ppm black, 600x300dpi / 2ppm colour. **Fax:** Plain paper & PC, 100 speed dials, 65 page memory. **Copier:** 600x300dpi colour* and black, up to 99 copies at a time. Digital zoom 50%-200%*. **Scanner:** 300dpi optical, 1200dpi enhanced. Includes OCR software.

*when using HP OfficeJet Document Assistant software

(55544)

\$890



HP OfficeJet 590

Colour printer • Fax • Copier • Scanner

Printer: 600x600dpi / 4ppm black, 600x300dpi / 1ppm colour. **Fax:** Plain paper & PC, 100 speed dials, 65 page memory. **Copier:** 300x300dpi colour, 600x300dpi black. Up to 99 copies at a time. Digital zoom 50-200%.

Scanner: 300dpi optical, 600dpi enhanced. Includes OCR software.

(50788)

\$765



Canon

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Canon BJC-5000

NEW

Colour Bubble Jet
Printer



(20756)

\$520

Just look at these features!

- ▀ **High resolution**
1440x720 dpi on special paper, 720x720 dpi on plain paper.
- ▀ **Uses TWO cartridges for higher speed**
High speed mode: 7.5 ppm black, 2.85 ppm colour*.
- ▀ **A3 capable**
In addition to A4/Letter full bleed printing, the BJC-5000 also prints on A3 paper.
- ▀ **PhotoRealism**
The combination of seven inks (with BC-21e and BC-22e inks) enables PhotoRealism printing. Also, for the first time, two types of light and dark black ink can be used in combination, improving difficult greyscale rendering.
- ▀ **Drop Modulation Technology**
Emits ink droplets of two different sizes from the same print head, for finer grained and faster printing.
- ▀ **Black text sharper and darker than ever**
with the new black BC-23 cartridge.
- ▀ **Banner printing**

*Approximate print speed

Canon BJC-4310SP

Colour Bubble Jet Printer

- ▀ **Super Economy Mode** for low-cost printing
- ▀ Canon's **Drop Modulation Technology™** delivers smoother colour gradations
- ▀ Use Canon's **PhotoRealism** inks for more colour combinations and virtually no pixelation
- ▀ Optional **scanner head**
- ▀ **Super fast black & white:** 4.5ppm*
- ▀ **Banner printing:** print banners up to six A4 pages in length!
- ▀ Resolution:
720x360 dpi



(68730)

\$268



*Approximate print speed

CanoScan FB320P / FB620P

Flatbed Scanners



- ▀ Only slightly larger than a sheet of A4 paper
- ▀ Spectacular image quality
- ▀ Comes with fun-filled photo-editing software
- ▀ Includes driver to convert your CanoScan FB320P or FB620P into a **photocopier!**
- ▀ Parallel interface
- ▀ Maximum document size A4/Letter
- ▀ Selectable resolution 25 to 2400 dpi

CanoScan FB320P

Optical Resolution:
300 x 300 dpi

(68733) **\$209**

CanoScan FB620P

Optical Resolution:
600 x 600 dpi

(68734) **\$274**

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Inkjet and laser printers



(67212)

\$249

EPSON STYLUS COLOR 440

- Excellent value, 720 x 720 dpi photo quality printing for the home
- Separate true black and tri-colour cartridges as standard
- Ideal for printing colourful school reports, full colour banners, greeting cards, invitations, newsletters and much more
- Features EPSON's exclusive PerfectPicture Imaging System
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- Exclusively for Windows®, supporting Windows® 98

Toner
N2000

\$370

(40789)

Toner
EPL1200

\$305

(58026)

Toner
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\$290

(11088)

Toner
EPL3000

\$219

(18343)

See the
Web-site
for others.

EPSON STYLUS COLOR 640



(67213)

\$349

- * Superb 1440 x 720 dpi photo quality printing for the home
- * Brilliant 720 x 720 dpi on plain paper
- * Features EPSON's exclusive PerfectPicture™ Imaging System
- * User friendly on-line guide on CD-ROM
- * Exclusively for Windows®, supporting Windows® 98

Purchase an Epson Stylus Color 640 or Stylus Color 440 in December and receive this fabulous Fun Factory Bonus Pack worth over \$200 for FREE. Includes:

- Live Pix Looney Tunes V2.0 (special edition) for Windows 95/98. Allows you to create cards, calendars, and invitations starring characters like Bugs Bunny, Daffy Duck, and Tweety Bird.
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EPSON PhotoPC 700

COLOR DIGITAL CAMERA

An outstanding new digital camera from EPSON

1.25 Mega-Pixel CCD



Complete exposure control. 2 times digital zoom. Internet ready image capabilities. Panorama auto-stitching for seamless 360° views. 10cm macro close-ups - photograph documents instead of copying them. Continuous shooting mode. Includes lots of image editing software & Adobe PageMill HTML editor.

\$1,368

(66204)

JUST
RELEASED!



EPL-5700 Laser

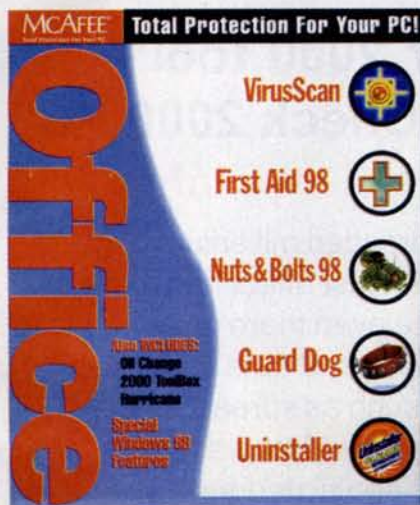
Networkable, speedy Laser printing with MicroGray 1200. Up to 8 Page per minute print speed @ 600 dpi resolution



(65064)

\$868

Total protection for your PC!



All the utilities, virus protection, operations and maintenance tools you'll ever need!

\$178

(70213)

McAfee Office

Includes:

VirusScan The world's best virus detection.

Nuts & Bolts 98 The ultimate Windows repair and optimization!

First Aid 98 Fixes Windows problems automatically.

Hurricane All the speed you'll ever need! Speed-enhancing tools to boost program launch times and prod slower disk drives.

Uninstaller Clean up your hard drive! Helps you weed and purge those old programs, files downloaded from the Internet, files left from programs, all that stuff that adds clutter on your PC.

Oil Change Scans your computer for installed software and hardware and then lists new updates & drivers available on the Internet.

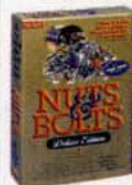
Guard Dog A must-have for every Web surfer! Stops destructive ActiveX and Java applets, downloaded from the Web. Seamless integration of privacy, security and anti-virus technologies.

2000 Toolbox The most complete Year 2000 check and fix.

NEW!

McAfee

Nuts & Bolts Deluxe



(58713)

\$110

PGP



(60523)

\$76

VirusScan Security Suite

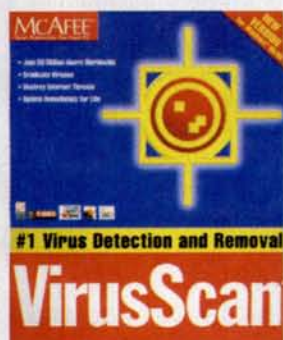


(53505)

\$99

For NAI enterprise products and licences call Harris Technology or check Web Direct

McAfee VirusScan® 4.0



#1 in Virus Detection and Removal. Stop viruses before they stop you!

\$87

(70215)

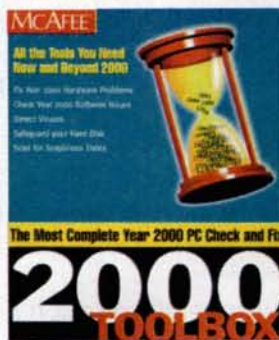
New version

VirusScan provides complete desktop protection with an array of scanning features that keep your system clean, mean and virus-free.

Using only the latest technology, VirusScan detects 100% of viruses including floppy disks, Internet downloads, e-mail attachments, Intranets, shared files, CD-ROM and online services (even inside the most popular compressed file types).

- Scan for viruses
- Schedule automatic system scans
- Receive virus detection updates
- Access additional protection tools

McAfee 2000 Toolbox®



2000 Toolbox is more than a millenium product. It's what you need for superior performance TODAY.

\$59

(65252)

Don't wait for the dreaded millenium bug to affect your hardware, software and data files! Get

prepared, get McAfee 2000 Toolbox!

Checks Time Clock Hardware and BIOS & fixes problems. Scans data files (incl. Excel, Access and others) for potential date problems. Scans for and fixes 2 year date fields in data files. Checks and optimizes Windows settings for operation beyond 2000. Scans popular applications.

McAfee 2000 Toolbox gives you overall PC protection, right now: Virus protection, backs up critical system regions and helps you get your system up and running in case of a disaster, monitors your system and alerts you to potential problems etc.

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Greenwich Mean Time

Check for Year 2000 issues

Check 2000
5 User Client
Server with
Data Scanner
& Collator

(61769)

\$439

Check 2000C/S
10 User PER
USER Price

(61767)

\$97



"The best year 2000 tool
we found was Check 2000 PC"

- Infoworld

\$88

(67329)

For:

BIOS check

BIOS fix

Software check

Advice

The dreaded millenium bug doesn't just affect hardware. It can be even more devastating to software and data files. Years of data such as spreadsheets, databases, dated entries, bookkeeping ledgers, etc are at risk of destruction.



What is the Year 2000 Bug?

This refers to storing the year-date field as two digits, so that the year 97 refers to 1997. The problem is that many

products in use worldwide will recognise the year 00 as 1900, not 2000. This problem can apply to lifts, aircraft, building security systems, and of course computer hardware and software.

Is it serious?

Yes, it will cause many products to cease to function properly. Many programs will fail to work at all and many will cause errors in calculations which are date related.

Can I just set my computer to 00 to test it?

You probably should not do this as it may permanently corrupt data or cause a program licence to de-activate

So now that you know what the Year 2000 bug is, how can Check 2000 PC Deluxe help you?

Check 2000 will find and fix year 2000 hardware (BIOS) problems on the spot. It will also tell you how your information and the software you use will be affected by the changeover. With Check 2000 you can re-run the program as many times as you like to continually monitor what is happening to your PC. Check 2000 PC can help you to set out your priorities as far as problems go so that you have plenty of time to fix them.

the software. Also be careful with other non-computer devices.

Which computer products are more likely to have the Y2k bug?

Older hardware and software. For example most 486 PCs or earlier, many of the early Pentium PCs 60/75/90 etc. Most software created throughout the 60s, 70, and 80s will have the bug, and much of the software created in the 90s.

How can I find out more?

Research as much as you can as quickly as you can. The problem is urgent for many companies. There are many articles in the press, and our Harris web-site points you to a wealth of information from IBM, Microsoft, Toshiba, and many other sites.

Can I avoid this problem?

By taking action you may, but by doing nothing you are taking a great risk. **Visit our web-link for more information or phone to talk to our staff.**

Check for the Millenium Bug while you still can!

December

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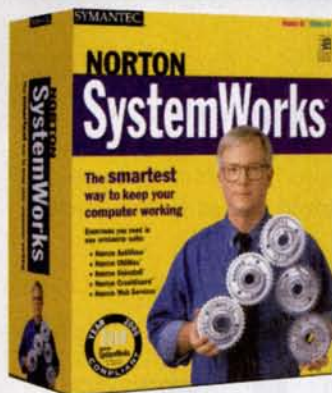
For "live" pricing and availability
have a look at this WebLink! ↓

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The Experts Choice

...in keeping PC's trouble-free
and productive

NEW!



(67223)

\$192

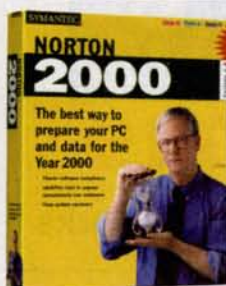
Norton SystemWorks

The first comprehensive and integrated utility suite!

Norton SystemWorks™ gives you five powerful Symantec utilities in one convenient package - at a great price. They work together to both fix and prevent system problems. And Norton SystemWorks is flexible enough to meet the needs of both novice and experienced PC users.

Includes:

- | | |
|----------------------------|---|
| Norton AntiVirus | 5.0 - Virus protection *New Version* |
| Norton Utilities | 3.0 - Problem solving, diagnostics and disaster recovery |
| Norton CrashGuard | 3.0 - Crash protection |
| Norton Uninstall | 1.0 - Uninstall and disk cleanup |
| Norton Web Services | 2.0 - Application updating |



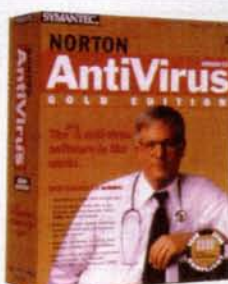
(70217)

\$71

NEW

Norton 2000

Save your valuable pc and data from Year 2000 crises! Norton 2000 finds potentially damaging dates in spreadsheet and database data. Tests and fixes system BIOS and clocks. Checks desktop applications for Y2K compliance. Automatically updates database of Y2K-compliant software. Supports central installation administration.

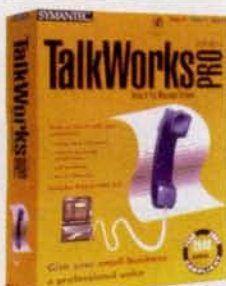


(67197)

\$88

Norton AntiVirus 5.0 Gold

The #1 anti-virus software in the world. Keeps your computer safe from viruses that might come in from e-mail attachments, floppy diskettes, Internet downloads, software CDs, or a network. It can be scheduled to automatically retrieve new anti-virus definitions from Symantec.



(67203)

\$227

TalkWorks Pro 2.0

If you need voice mail, message notification, call tracking, or fax on demand, TalkWorks gives your home office/small business a professional voice. Set up separate mailboxes for employees, use pre-recorded greetings, remote notification via pager or cell phone when a voice or fax message arrives, and much more.



(67201)

\$146

WinFax Pro 9.0

The #1 choice for hassle-free faxing. Fax right from your computer or laptop. **Allows an entire workgroup to share a modem and phone line**, so everyone can send and receive faxes without bying multiple modems or additional phone lines! Save money by sending broadcast faxes and scheduling faxes for off-peak times.



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SYMANTEC.
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PROGRAM

Norton Ghost



The fast PC cloning solution. Reduce PC roll out and upgrade times by 90%! Call for licencing info and pricing.

pcANYWHERE™ 8.0



(52653)

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Norton Utilities Gold



(55021)

\$105

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(58206)

\$167

Norton Mobile Essentials



(61870)

\$124

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Intelligent Graphics at Work

NetworkCharter

NetworkCharter is an indispensable tool for anybody charged with maintaining, designing or configuring computer networks. With discovery functionality built-in, NetworkCharter automatically identifies all devices on a network in a non-intrusive manner. Its documentation functionality automatically creates diagrams, databases, and extensive reports of the network, while its design capabilities, speeds and simplifies the complex task of creating network designs and selecting and configuring network devices. NetworkCharter is much more than drawing - it's true network design intelligence at your fingertips.

So, what are the differences between NetworkCharter and NetworkCharter Pro?



Feature	NetworkCharter	N/C Pro
Discovery	150 nodes/LAN	Unltd Nodes
Visio Conversion	Yes	Yes
Extensive Reports	All Exc. Y2K	All
Queries	Yes	Yes
Wizards	Network Design	All
Library	5,000	10,000



(69447)

\$619

(70327)

\$1,919

The Intelligent Way to Discover, Document, and Design Networks

FlowCharter 7



The most productive diagramming solution to manage business processes.

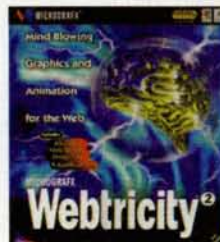
FlowCharter creates incredibly powerful, interactive diagrams of just about everything imaginable - business processes, workflow, computer networks, web sites, databases, and more. **FlowCharter 7 Includes:**

- Patent-pending Living FlowCharts -- interact with your diagrams
- Shape Action Wizard -- assign functionality to shapes
- CoolSheets -- create professional-quality diagrams in seconds
- Media Manager -- store and organize all of your graphics
- WebCharter -- generate web site diagrams with ease
- Full Microsoft Office 95 and 97 compatibility • Over 3,800 diagramming and technical shapes
- 5,000 illustrations and clip art and more.

(36067)

\$495

Webtricity 2



Create Mind-Blowing Graphics and Animation

The power of Micrografx Webtricity 2 is unlike any other program on the market. It includes: Picture Publisher 8, Simply3D 3, Windows Draw 6, and Media Manager 8. Four tools that work together to outperform any other single package on the market.

What is in it?

- 80,000 Pieces of Web-ready, royalty-free clip art
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- 25,000 Vector clip art
- 3,000 Vintage illustrations
- 1,000 3D objects
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- 33,000 Additional vector clip art

(68433)

\$118

Other Product

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V3.0
(70389)
\$148

Graphics
Suite 2.0
(38706)
\$574

Picture
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(60132)
\$229

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Used by thousands of accountants!



The MAUS Consultant's Pack gives you the forms, tools & know-how to establish a Business Planning Consultancy. Includes MAUS MasterPlan Professional, the Consultant's Guide, special consultancy software, questionnaires for clients, and a training manual.

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Job Descriptions

Over 3,500 sample job descriptions.



MAUS Job Descriptions will help you create clear, concise job descriptions in minutes! Simply choose from the 3,500 built-in jobs and edit or even combine duties from different jobs. Next, use the simple question and answer approach to address the physical and educational requirements, work environment, qualifications and supervisory responsibility. MAUS Job Descriptions will then take your answers and write a comprehensive job description that's fully customised to your organisation... it's that fast. It's that easy!

(34334)

\$189

Performance Review

Write employee reviews in minutes!



Regular employee reviews will help you maintain a happy, productive and motivated team. Simply choose from the dozens of performance criteria such as initiative, leadership, job knowledge, problem solving ability, and sales skills...to name just a few! Next, use the simple 1-5 grading system to rank your employees in each area. MAUS Performance Review will then support your ratings with clear, effective text...it's that fast. It's that easy!

(34337)

\$189

NEW RELEASE Debt Collector

Turn your debts into cash!



- Reduce bad debts
- Cut collection time and costs
- Automatically sends 30, 60, and 90 day reminder letters
- Stand alone contact manager stores all debtor details
- Includes professional letters, legal documents and advice.

(70170)

\$189

MAUS Debt Collector is a complete debt collection system which automatically mail merges reminder and demand letters, reminds you of phone calls and action to take, and prompts you step-by-step through the entire debt collection process.

Stockmarket Plus

Manage, monitor & grow your investments



Use MAUS Stockmarket Plus to generate instant profit/loss reports allowing you to test the profitability of different investment opportunities and even provide a tax assessment of your investments!

Some of the key benefits:

- User friendly with comprehensive help functions
- Portfolio Management System allows you to quickly view all the stocks in your portfolio
- Compiles automatic 'Gain/Loss' reports, Transaction reports, Brokerage reports, Holdings reports & detailed dividend reports

(69169)

\$189

Other
MAUS
product

MAUS
Action
Planner
(69168)

\$189

MAUS
Master Plan
Standard
(36813)

\$110

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for more
information
on MAUS
Business
products

December

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43

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Voice Input - Speech Recognition

ViaVoice 98 EXECUTIVE

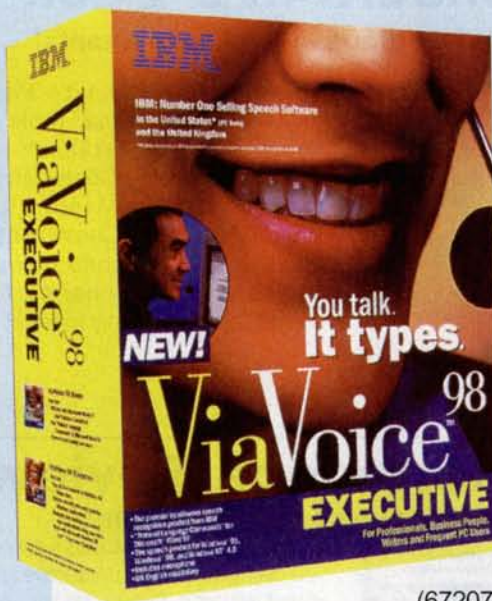
You Talk. It Types.

Be more productive than you thought possible...
With all-new ViaVoice 98 EXECUTIVE!

Key Features:

Powerfully Useful Speech Recognition

- Dictate directly into Ms Word 97 and the most popular Ms Windows applications, using normal continuous speech. Create text faster than most people can type.
- Use the power of your voice to create reports, presentations and spreadsheets quickly.
- Say numbers, currencies, dates and prices normally and they appear in the correct format.
- Enjoy high recognition accuracy - ViaVoice 98 uses 3 word context checking to help it recognise the words you dictate
- Create "VoiceText" dictation macros to insert standard paragraphs without having to stop dictating.
- Control your PC by launching programs with your voice. Say file names, toolbar buttons, and icon names with "Say What You See" navigation
- Switch between commands, correction and dictation quickly, easily and naturally, thanks to the new modeless operation.



(67207)

\$268

- Enjoy high recognition accuracy - ViaVoice 98 uses 3 word context checking to help it recognise the words you dictate
- Create "VoiceText" dictation macros to insert standard paragraphs without having to stop dictating.
- Control your PC by launching programs with your voice. Say file names, toolbar buttons, and icon names with "Say What You See" navigation
- Switch between commands, correction and dictation quickly, easily and naturally, thanks to the new modeless operation.



ViaVoice Home

PC voice control using normal continuous speech

- * Direct dictation into MS Word 97
- * ViaVoice Outloud - reads documents aloud eg email to user
- * Context recognition
- * Audio playback
- * Large vocabulary - 64,000 word base vocabulary (can add another 64,000)
- * 240,000 word backup dictionary
- * Shortcuts - to insert standard paragraphs/phrases etc
- * Multiple user and multiple environment support
- * Microphone, CD software, Command reference Card and User Guide supplied

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discounts
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pricing
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December

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44

(70329)

\$113

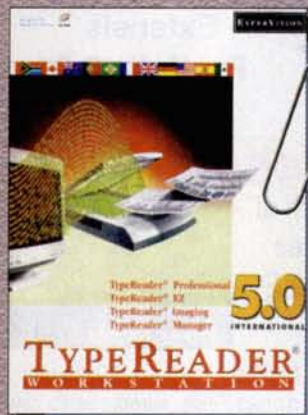
HARRIS

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Several finance methods
available, subject to approval

Scan, Search, Organize



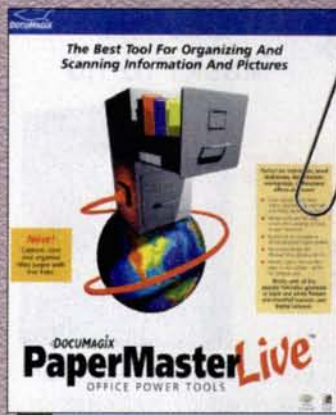
Expe **TypeReader Workstation 5.0**

Fast, accurate OCR

(65869) **\$475**

OEM Available with scanner purchase - \$234

TypeReader is an OCR and document management software that scans and recognizes English, French, German, Italian, Spanish and Portuguese and saves to a Word Processor, HTML or PDF format. Identifies graphics, table and complex text formats. High accuracy on faxed images or degraded documents. Recognizes over 2,100 fonts.



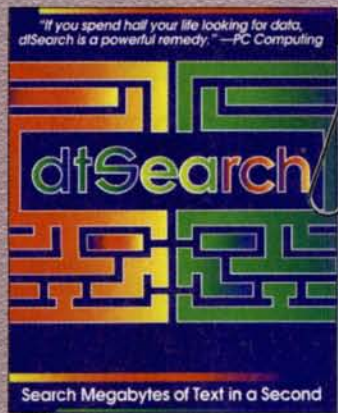
DocuMagix **Paper Master Live**

Scan & organize
information
and pictures

(62934) **\$195**

OEM Available with scanner purchase - \$165

All your important documents at your fingertips. Faxes, business cards, memos, articles, pictures or even Web pages, PaperMaster Live lets you organize, store, find and retrieve what you need, fast. It's a filing cabinet on your desktop! It even lets you capture and save Web pages, with the links working!

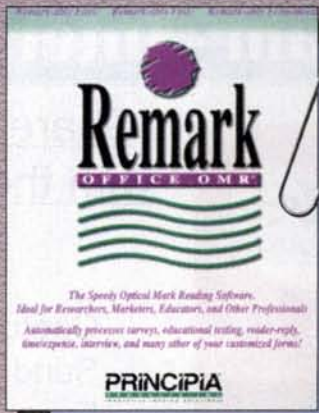


DT Software **dtSearch**

Search
Megabytes of
text in a second

(26439) **\$344**

Instantly search gigabytes of text on your PC or network! Features many search options like: Adjust search fuzziness from 1 to 10 to sift through OCR and "typogrpqal" errors. Thesaurus for concept or synonym searching. File viewers to browse retrieved files, jumping from one highlighted hit to the next or search a retrieved file for new text. Natural language search.



Principia **Remark Office OMR**

Fast optical mark
reading software

(70384) **\$689**

Ideal for researchers, marketers, educators and other professionals. Processes surveys, tests, questionnaires and other office forms without manual data entry. Simply scan your form and Remark will display the recognized data in a spreadsheet style grid. You can train the software to recognize OMR bubbles, barcodes, and image fields.



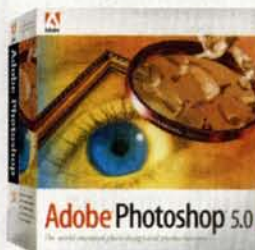
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THESE HOT BUNDLES GIVE YOU MORE TIME TO BE CREATIVE!

Adobe Photoshop 5.0

+

Extensis Mask Pro 1.0



\$495
worth of
value
FREE



Adobe Photoshop software is the de facto standard for digital image enhancement, photo retouching and image compositing.

Extensis Mask Pro 1.0 is a powerful Photoshop plug-in that takes the pain out of creating image masks. Its innovative colour matching technology and elegant vector-based clipping paths slash the time it takes to create professional quality masks.

Together for only

\$1,169

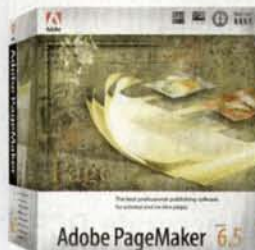
(66934)

Education **\$458** (66940)

Adobe PageMaker 6.5

+

Extensis Portfolio 3.0



\$245
worth of
value
FREE



Adobe PageMaker 6.5 is the professional, cross-platform desktop publishing program that makes it easy for you to design and produce sophisticated publications.

Extensis Portfolio 3.0, formerly named Fetch, introduces its new name and a newly expanded set of powerful tools for managing digital content. You will view, organize, manage, select, share and use digital content like never before.

Together for only

\$1,169

(66938)

Education **\$359** (66941)



Logitech Cam - Internet Video Camera

Share the moment on the moment
with the new Logitech Internet video camera.



- * Capture stills and video.
- * Send video mail at amazingly fast speeds.
- * Even hold live Internet video calls.

Its built-in microphone and TrueView™ design make meeting face-to-face online completely natural. **So see what you can do.** And let others see it, too. Windows® 98 and **USB compatible.** Includes "FREE: 4 virtual reality games from Reality Fusion"

\$273

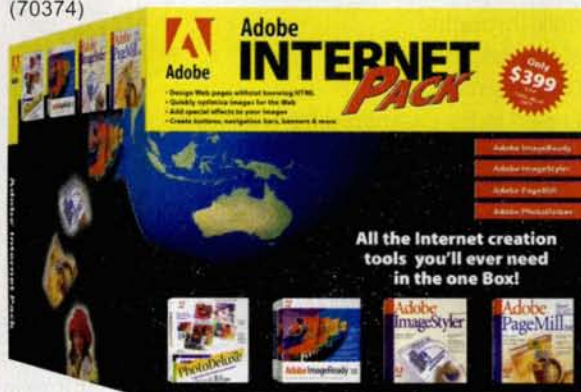
(69969)

Leading Image Software

Take advantage of this
spectacular offer now!

It ends 31/01/99

(70374)



Adobe INTERNET PACK

- Design Web pages without knowing HTML
- Quickly optimize images for the Web
- Add special effects to your images
- Create buttons, navigation bars, banners & more

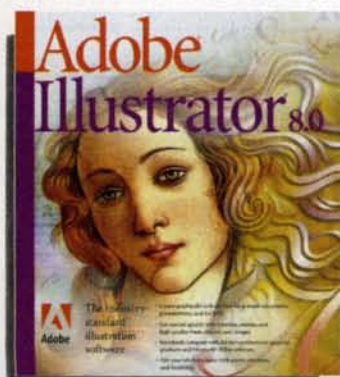
Four Adobe Internet creation tools in the one box!

- ImageReady® 1.0** Streamlined image processing for the Web professional
- ImageStyle® 1.0** The easy way to create professional-looking Web graphics
- PageMill® 3.0** The easiest way to create and manage pages for the Web
- PhotoDeluxe® 2.0** Easily modify and personalize your own photos

Value: **\$820**

Special price:

\$384



Adobe Illustrator® 8.0

The world's
best drawing
program just
got better!

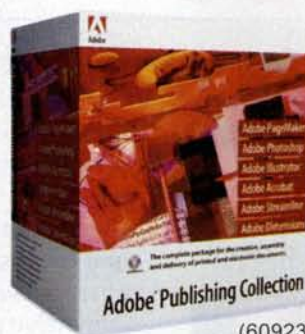
The industry-standard illustration software, preferred by designers, graphic artists, technical illustrators, and business professionals around the world.

Its time-saving features and superior integration with Adobe Photoshop, ImageReady and PageMaker as well as drag-and-drop convenience with Microsoft Office and other graphics applications, help you create eye-catching artwork for print, presentations, and the Web in an exceptionally smooth workflow.

New
version

(67039)

\$736



(60923)

Adobe Publishing Collection

6 products
in 1

Great Value!

Includes the following great Adobe products:

- PageMaker® 6.5** Professional page-layout software
- Photoshop® 5.0** Create, paint, correct, and retouch photos
- Illustrator® 7.0** Industry-standard illustration software
- Acrobat® 3.0** The fastest way to publish any document online
- Streamline® 4.0** Convert images to line art
- Dimensions® 3.0** Powerful 3D rendering tool

Bought separately,
they would cost over
\$3,500!

\$1,839

More from Adobe®

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(41192)

**Streamline®
4.0
\$266**
(41188)

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1.0
\$290**
(62574)



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**Web
Direct**www.ht.com.au/cat/livepicture

Create Totally Immersive Web Sites

reality studio™

Perfect for:

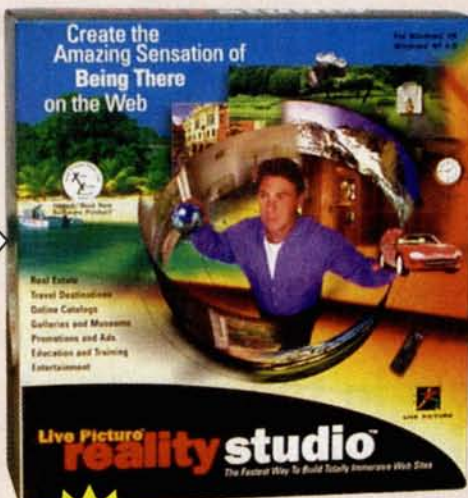
- Real estate "walk-throughs"
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- Galleries and museums
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- Consumer electronics products
- Education and training
- Entertainment



Create & manipulate multimedia:

- Quickly and easily create 360° panoramas from photographs, slides, digital cameras or video frames - powerful, seamless auto-stitch
- Easy to create, high quality 3D objects, with exclusive automatic masking. Users can grab and rotate these objects in your scene
- Enhance your scene by adding sound and video, you can even add directional sound for the ultimate immersive experience
- Create hotspots that link to HTML pages and embedded URL's
- FlashPix technology lets users zoom in to inspect minute details in real time. Edit and save FlashPix using Adobe® Photoshop®

NOTE: This special low price is available until December 31 1998.
Normal RRP is \$899 (Windows® 95, 98 and NT)

Includes:
Reality
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Studio
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Image
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1 user lic**Special
Low
Price**

(22744)

\$335

photovista

Perfect for Digital Cameras

Creating panoramas with PhotoVista is fast and easy. There's no need for specialised equipment or expertise. Simply photograph your scene, transfer your images to your computer and let PhotoVista do the rest.

PhotoVista's powerful stitching engine automatically wraps, aligns, and blends the images to create a seamless 360° panorama. No other software package makes it so easy and affordable to create immersive panoramas for the web.

Features:

- Automatic warping, aligning and blending to create 360° panoramas for the Web or print
- Extremely compact files, typically less than 100K
- Built in support for popular cameras
- Support for popular formats such as BMP, JPEG, PICT and GIF
- Automatic calculation of the number of images to shoot for each lens type
- Panoramic image printing
- Save as a screen saver

(Windows® 95, 98 NT)

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for details

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choice of
LivePix
software
for
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Deluxe 2.0** (A)
Deluxe Photo-
editing software.
Also includes multi-
media E-mail
application.



**LivePix
SOHO** (B)
Create brochures,
flyers, business
cards, letterhead,
labels & envelopes
quickly & easily.



**Looney-Tunes
PrintStudio** (C)
The entire family can
use their photos to
create fun photo
projects with their
favourite characters

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Several finance methods
available, subject to approval



Microsoft Office 97 Value Pack

MS Office Value Pack includes all of the following great software for one low price:

MS OFFICE PRO 97 Upgrade - integrated suite of essential business tools: Word 97, Excel 97, Outlook 97, Powerpoint 97, Access 97. **PUBLISHER 98** - the worlds leading business desktop publishing application. **ENCARTA WORLD ATLAS 98** - a comprehensive multimedia geographic atlas. **MONEY 98** - task oriented program to manage personal finances. **GREETINGS WORKSHOP DELUXE** - Create great multimedia greetings for the internet or email. **INTELLIMOUSE** - features one step zoom and scroll features in Office 97 applications. **SYMANTEC NORTON ANTIVIRUS V4.0** - eliminates viruses from the networks, floppy disks, hard disks, email attachments, CD-ROMs, and Internet downloads.

(59664)

\$598



Windows® 98

This is the first time that hardware, applications, software and operating systems have come together in such a complete manner. Windows® 98 greatly enhances the experience of PC computing when it is matched together with the right hardware and software.

*Windows® 98.
Works Better.
Plays Better.*

Full Version (60621)

\$269

Upgrade (60622)

\$139

Plus! 98

(60624)

\$59

Microsoft PhotoDraw 2000

The Graphics Companion to
Microsoft Office



PhotoDraw 2000

Now business users can create professional-looking artwork to enhance their marketing materials without having any graphics design experience. Microsoft® PhotoDraw™ combines powerful illustration and photo-editing in one easy-to-use program that works just like Microsoft Office. Easily create custom graphics for Microsoft® Office documents and the Web. Enhance your communications with high impact business graphics the easy way!

(69781)

\$249

Combat Flight Simulator



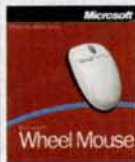
Microsoft Combat Flight Simulator features the same detailed attention to flight physics and instrumentation as

Microsoft Flight Simulator - now combined with computer-controlled wingmen and enemies to recreate the legendary battles of WWII fighter pilots.

(29382)

\$84

Wheel Mouse



Built to meet strict standards, Wheel Mouse is solid and reliable - just what you'd expect from a Microsoft product. Features innovative wheel in the face of the mouse. Roll the wheel forward or backward instead of clicking on a scroll bar or arrow. It's a fast and easy way to move through documents.

(60466)

\$39

Intellimouse Pro



Features innovative wheel in the face of the mouse - one step Zoom & Scroll features in Office 97 applications, zoom in to view data instead of hunting for menus, buttons & scrollbars, 3 types of scrolling, - rotate wheel for incremental scrolling. Press wheel & move mouse for fast scrolling. Click wheel once for "Autoscroll". **A new level of comfort & efficiency with its innovative design & advanced zooming & scrolling capabilities.**

(29382)

\$84

Intellimouse

Features innovative wheel in the face of the mouse - one step Zoom & Scroll features in Office 97 applications, zoom in to view data instead of hunting for menus, buttons & scrollbars, 3 types of scrolling, - rotate wheel for incremental scrolling. Press wheel & move mouse for fast scrolling. Click wheel once for "Autoscroll"

(32988)

\$98

Intellimouse Trackball



Ergonomically designed for greater user comfort, IntelliMouse Trackball incorporates the wheel technology in a trackball format. Utilizing the finger instead of the thumb to manipulate the trackball, users can increase their mouse control while, conserving desktop space by allowing the user's hand to remain in a stationary position.

(61280)

\$123

Basic Mouse



- Serial or PS/2 connection
- Two button
- Ambidextrous
- Fits a range of hand sizes
- Easy set-up with no software to install, The Basic Mouse works with either serial or PS2 ports.
- Great value

(61280)

\$123

SONY®

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(30916)

2.3 / 2.6Mb
MO
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The Future Is On Our Minds



Monitors	100ES	200ES	200GS	400PS	500PS
Our part number	(66055)	(58205)	(58798)	(57451)	(58544)
Trinitron® CRT Size	15"	17"	17"	19"	21"
Viewable Image Size	14"	16"	16"	18"	19.8"
Maximum Resolution	1280x1024 @60Hz	1280x1024 @60Hz	1600x1200 @60Hz	1600x1200 @ 75Hz	1600x1200 @ 85Hz
Price	\$599	\$1,079	\$1,349	\$2,229	\$3,724

Please call or see our Web Direct for more information on these and other Sony monitors

Sony CD Writable

CDU948SBK



4x Write
8x Read

(61326)

\$1,015

Interface: SCSI-2. Writing speed 1x, 2x, 4x, reading speed 1x, 2x, 4x, 8x, spin up time 2.5s. Buffer memory 2MB. Writing methods: track-at-once variable and fixed packet, track reservation, disk-at-once. Average access time 20ms. Comes with CD-mastering software. Fits a standard horizontal 5.25" 1/2 height PC drive bay.

3.5" Floppy Disk Digital Camera

The easiest way to capture and e-mail your pictures anywhere in the world instantly or even put them on the Internet.

Sony Digital Mavica MVC-FD91

Removable 3.5" 2HD floppy disk storage media. XGA (1024 x 768 pixel) resolution. Up to 20 still shots fine mode/40 shots standard mode per disk (VGA JPEG), 8 fine mode shots/16 standard (XGA JPEG). MPEG Movie mode (up to 60 sec.). 14x optical zoom. Optical Steady Shot. Voice memo mode. Email and Non-compression (BMP) modes. 2.5" Colour LCD screen. Auto flash. Self-timer. Six picture index on LCD. Date/Time stamp. SLR camera-type design.



NEW

\$2,675

Sony Digital Mavica MVC-FD81

Shares most of the same features as the MVC-FD91 with the exception of the Optical Steady Shot function and 14x zoom lens. The MVC-FD81 is instead equipped with a 3x zoom lens.

(69230)

\$1,990



It's a Sony

Sony offers a complete range of innovative Data Media storage solutions. You'll find room for practically anything!



Floppy Disk



4mm Tape



3 1/2" MO



5 1/4" MO



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CD-R



QIC-WIDE



TRAVAN™



ZIP™

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or T/T. Call for details.



All new acceleration for your PC!

Sonic Impact S90

Hot 3D Wavetable Audio!



(69486)

\$122

Diamond's Sonic Impact S90 uses advanced A3D technology to bring life-like positional 3D game play to your PC. Sonic Impact S90 includes hardware acceleration for 64 wavetable voices and Aureal's A3D to immerse you in the middle of the action. Add realistic atmospheric effects, including fog and underwater sounds, and you have total audio transformation for your PC.

- PCI design for faster system performance
- 64 Hardware wavetable voices
- Supports downloadable samples
- Runs with DOS, Win95/98, Win NT 4.0

Monster Fusion

2D and 3Dfx acceleration on one card

Monster Fusion combines 16MB of 3D gaming power with fantastic 2D graphics acceleration, all in a single card. Diamond has built on 3Dfx's Voodoo Banshee technology to deliver 1920 X1440 resolutions and 60+ frames/second game play. Yes, it's Fusion Time, baby!

- Available in PCI and AGP configurations
- Supports Glide, Direct3D and Open GL APIs

(68381)

\$324

NEW



Explosive software bundle in special retail packs

VIPER V550

The Next Generation!



Looking for the most powerful graphics card on earth?

Diamond's next-generation Viper V550 combines 16MB of fast SDRAM, a breakthrough dual-processing architecture and hardware OpenGL acceleration to deliver workstation levels of 2D and 3D power, lightning-fast 3D game play and support for software DVD.

- Available in PCI and AGP 2X configurations.
- 128-bit dual processor architecture
- OpenGL and DirectX acceleration
- Software DVD support (AGP)
- Hot software bundle
- 16MB of SDRAM

(66530)

\$422



Monster Sound MX300

Ultimate 3D Audio Experience!!!

NEW

Want to annihilate your opponents every time? Diamond's Monster Sound MX300 delivers awesome combat tools: Aureal's latest A3D 2.0 positional audio, 4-speaker support and 64-voice hardware wavetable synthesis. Imagine playing your favourite PC game hearing footsteps from behind you and gun shots from overhead. Monster Sound MX300 delivers unbelievable 3D effects to give you the unfair advantage.

- Hardware A3D 2.0 Acceleration
- Accelerates up to 96 hardware streams
- Advanced 320-voice wavetable with support for downloadable samples
- Supports DOS and Windows games

(70214)

\$385



Stealth II G460

8MB of AGP 2X Graphics Power

Let your PC show you brilliant colours and razor-sharp resolution. Stealth II G460 includes 8MB of SDRAM with AGP 2X power to make games and business applications come alive. Designed for use with Intel Pentium II processors only.

- 8MB SDRAM
- Powerful 2D and 3D acceleration
- Supports Windows 95/98 and NT 4.0

(61190)

\$297



HomeFree Easy Wireless Networking!

No holes! No cables! HomeFree delivers 1MB wireless links for up to 16 PCs, 45 metres apart.

Includes point-and-click network setup, software for shared Internet access, all at an incredible price. Windows 95/98 only.

- Frequency hopping for maximum security
- 45-metre range
- Each kit contains 2 nodes

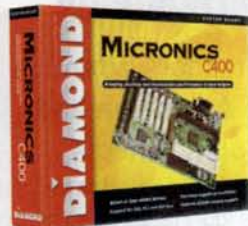
NEW

Desktop Pac: 1 ISA / 1 PCI

(70218) **\$382**

Combo Pac: 1 ISA / 1 PCMCIA

(70219) **\$438**



Micronics C400

The Ultimate Multimedia Platform

NEW

Diamond's Micronics C400 motherboard is the perfect platform for your ultimate multimedia system. Featuring Intel's 440BX AGP set, it supports Pentium II and Celeron processor up to 450MHz, Ultra DMA/33, USB, IR communications and advanced system monitoring features. For your totally accelerated PC, start with the best!

- Legendary Micronics quality & performance
- 5 PCI slots (1 shared)
- Award BIOS on 1MB flash

Please call for pricing or see Web Direct link.



Design and Creativity

**IDEAL
for the
HOME**



We have a large range of clip art titles from IMSI.

Please call and talk to our sales staff or see the web site for more information.

**Windelete
97**

\$56

(52730)

**Floorplan
3D Deluxe**

\$87

(50350)

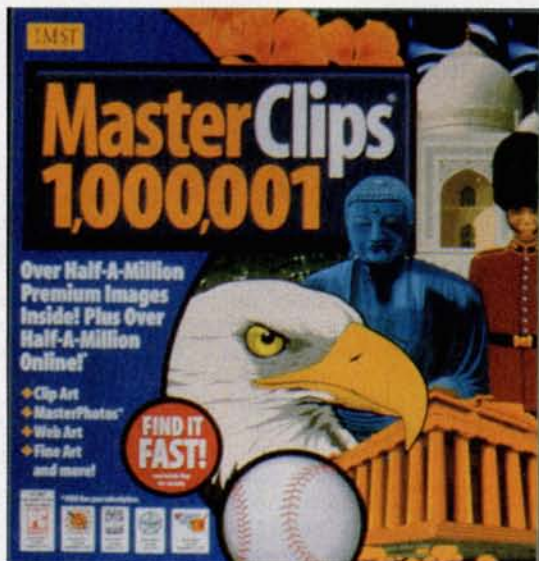
**IMSI
Home
Collection**

\$92

(52740)

December

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IMSI MasterClips 1,000,001

The worlds finest and largest collection of top quality clip art. Unbeatable access to the perfect image each and every time. Masterclips includes thousands of exclusive clips and images you won't find anywhere else. Choose from an exciting collection of Web Art images and dazzling animations for the web, a spectacular array of photos and photo objects that will enhance any and every brochure, document or presentation you wish to create. Finding that perfect image is easy when you use the MasterClips browser to search and view thumbnails of the entire collection. A simple key word will target in on the category of clip you are seeking. MasterClips 1,000,001 also includes a full colour sampler manual.

(70381)

\$199

MasterClips Publisher

Create it at Home



(70382)

\$80

Publishing from home or your office? It's both easy & fun with MasterClips Publisher. Wizards & templates walk you from layout to finish. Or you can create your project entirely from scratch. Whether for print or the Web, MasterClips Publisher is all you need to make any document attractive & effective.

MasterClips Email Animator



(66165)

\$54

Grab readers attention with Animation and Sound Effects

Masterclips Email Animator is a unique multimedia tool that enables users to add spectacular animations, sound, graphics and fun to their email messages. Includes 740+ drag and Drop animations, 500+ backgrounds and borders, 600+ music and sound clips and more.

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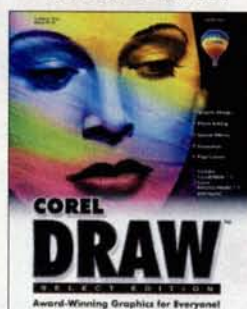


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The cover discs: apcmag.cd

These discs have two main aims:

- To provide fast, easy access to the files and resources we talk about in *APC* and to save you download time and money.
- To make it easy for our readers to get on the Internet so they can use our new interactive Web site.

The kit contains browsers, file-transfer programs, mail and newsreaders and much more for each of the major operating systems. To make it as easy as possible for readers to get online, we've also included reader offers and a sign-up kit.

apcmag.cd aims to complement both the magazine and *APC*'s Web site. The concept is simple: when you read about a program in the magazine, such as a piece of software from a Shareware column, you need only insert the relevant CD, browse it with your favourite WWW browser, and download the file directly from the CD. Each piece of software includes instructions on whether you will need to unzip the file before installing it; most also include Readme files.

Using the CDs

Everything you need to use **apcmag.cd** has been created in HTML. You don't need any spe-

cial software to access the discs, other than a standard browser, and it will work on most common platforms.

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As with any site on the Web, the software on these CDs is provided as is, in the hope that it will be useful to you, and without any warranty, express or implied. If you're interested in a product or service we review or refer to, contact the company that distributes or supports it for more information, or to discuss any problems you may have with it.

You should carefully read the licencing agreements and honour any evaluation or shareware terms specified, read all instructions and Readme files, and virus-check every program before use. We check the CDs with the latest available tools each month, but new viruses appear every week.

While we've taken every care to ensure that the software provided is useful and that it works, we cannot accept responsibility or liability for any of the products included.



How to run the CDs

Windows 95 and NT users

These CDs use an AutoRun feature for Windows 95 and NT systems. Just insert **apcmag.cd** and your browser will automatically load with the **apcmag.cd** front page.

Note: First-time users will be prompted by a browser set-up program (SETUP32.EXE) which will allow them to install a browser or update your current browser. This program is only loaded once, and subsequent use of the CD will automatically start your installed browser.

Win 3.x, OS/2, Mac, Linux

Simply launch your favourite browser and load the file DEFAULT.HTM in the root directory of the CD.

If you don't have a browser, run the file INSTALL.BAT in the root directory of the CD.

The CDs have been tested using Netscape Navigator 3.0 and 4.0, and MS Internet Explorer 3.0 and 4.0.

Conditions of entry

Instructions on 'How to Enter' form part of the Conditions of Entry of all competitions in *APC* December. Entry is free and open to all residents of Australia other than employees of APC Publishing Pty Ltd (ACN 053 273 546), suppliers of competition prizes, their families and associated agencies.

The contests close last mail December 17. Enter according to the instructions supplied with the individual competition. The contest will be judged by a panel appointed by APC Publishing Pty Ltd on December 17, 1998. The judges' decision in relation to any aspect of the competition is final and binding on every person who enters. No correspondence will be entered into. Chance plays no part in determining the winner. No responsibility is accepted for late, lost or misdirected entries. All entries become the property of APC Publishing Pty Limited, the promoter, 54 Park Street, Sydney, NSW 1028.

The prizes are not transferable or redeemable for cash. Any change in the value of the prizes occurring between the publishing date and the date the prizes are claimed is not the responsibility of the promoter.

Winners will be notified by security post and their names published in the February 1999 issue of *APC*.

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Email: workshop@apc.com.au

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Phone: (02) 9288 9162
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We welcome readers' letters, ideas for articles or reviews, information on new products and companies, and any insight they can give into the PC industry or the use of technology.

Article ideas

Please let us know if you have an idea for an article or review you'd like to write, or that you'd like to see us cover in *APC*. We appreciate submissions, but can't guarantee a reply. Please send (preferably by email) a brief résumé with an outline of your experience and interests, and a sample of your writing with an outline of the article you have in mind.

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Whip out one of these titles while you're catching some rays at the beach, and you're sure to look cooler than your Grisham-reading neighbour.

Biblio fusion

Fusion 3 Bible

In an area as dynamic and rapidly changing as Web page design, there is a constant demand for new books. This is somewhat ironic, considering that even with the shortest possible lead times, a book about the latest Web design software can only have an expected lifetime measured in months. So while it's still relevant, you might as well have a look at the *Fusion 3 Bible*.

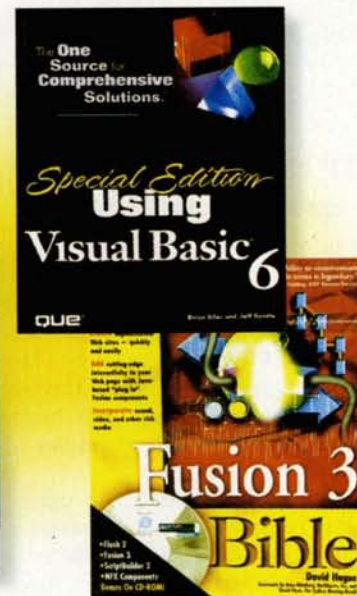
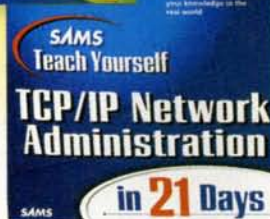
This latest title from IDG's *Bible* series discusses one of the hottest current Web page design packages, NetObjects Fusion 3.0, and is written by Australian Web developer David Hague.

The book is clearly laid out, and has plenty of useful, relevant screenshots and diagrams. Hague's writing is informal and clear; he explains simple concepts well, without becoming tedious. The book is occasionally confusing on more complex topics, but at least it goes into some depth and doesn't avoid the tricky subjects. Interestingly, it only deals with the 95 version of Windows, and the bundled software is only for PC.

Beginners will find this book very handy. The first two sections are as much a tutorial on designing Web pages as they are a guide to using Fusion 3.0. There are plenty of hints, tips, references to more information, and things to look out for.

As with most books of the genre, advanced users may find it a little unsatisfying. The later sections of the book deal with advanced techniques, such as forms, frames, database integration, actions and layers. You might be able to learn how a database integration works using Fusion 3.0, but you would still need to do some work before you knew how to do it yourself.

As well as a trial version of Fusion 3.0, the CD also includes trials of Flash 2.0, ScriptBuilder 2.0 and Infini-D. The CD does not have an Autorun or menu program to help you find the software and examples. This is also the first book of its kind I've seen



that doesn't have a glossary of Internet terms or a table of HTML tags at the back.

Josh Mehlman

■ Author	David Hague
■ Publisher	IDG Books Worldwide
■ Distributor	Woodslane
■ Phone	(02) 9970 5111
■ Price	\$110
■ ISBN	0-7645-3132-8
■ Rating	★★★☆

Mastering Java 1.2

The Java language is something of a moving target. Just when you thought you had come to grips with the changes made in the 1.1 specification, beta compilers for Version 1.2 have already begun to appear. And yes, Java 1.2 books are appearing as well. The first we have received is *Mastering Java 1.2* by John Zukowski.

This book is quite large. Although really large books are often bloated with irrelevant information or unnecessarily long code examples, this is not the case with *Mastering*

Java 1.2. It's a meaty book, full of helpful information and useful examples.

The title sets its sights on teaching experienced programmers how to use the Java 1.2 specification to its fullest extent. New users may find the text a little heavy as an introduction to programming, but experienced programmers of any language will appreciate the fact that Zukowski wastes little time with philosophy and quickly moves onto implementation.

Where *Mastering Java 1.2* excels is in the examples Zukowski provides. Most concepts presented include relevant code, and illustrate potential uses for the code. For example, one of the codes on using GUI components

Guide to ratings

★	A lemon in a pear tree
★★	Too silent a night
★★★	O come all ye faithful
★★★★	Decks your halls
★★★★★	Jingles your bells

also illustrates the use of stacks to implement a Reverse Polish Notation calculator. These sorts of examples prove to be more interesting to experienced programmers than the typical 'hello world' style programs.

Whether you're a Java programmer looking for a 1.2 reference book, or a programmer looking to add Java to your toolset, this book is a must.

Travis Simon

■ Author	John Zukowski
■ Publisher	Sybex
■ Distributor	Addison Wesley Longman
■ Phone	(02) 9428 8000
■ Price	\$109.95
■ ISBN	0-7821-2180-2
■ Rating	★★★★

TCP/IP Network Administration in 21 Days

The author of this book, Brian Komar, is an experienced network consultant and he has written a clear, linear manual that covers every square inch of the rocket science that is TCP/IP administration. The reader is besieged by complex theory, which is fun to try to wrap your brain around, and walk-through examples of real-world applications.

The format will be familiar to many. Take a large, complex topic and proceed to break it up into easily digestible chunks — in this case, 21 of them. Provide questions at the end of each chapter to reinforce what the readers have just learnt. The only problem I had was trying to remember what I had learnt the previous day. To avoid this, some readers may end up having to cram all of the material into a couple of days.

The end of the book covers applications

of TCP/IP, and is very useful for budding TCP/IP administrators. Readers are taken through the intricacies of setting up TCP/IP on all of the popular desktop client operating systems. Komar also takes you step-by-step through the more complex pleasures of enabling TCP/IP support and routing, for both Windows NT and NetWare server operating systems. All of the mainstream TCP/IP applications, such as IP addressing, DNS and DHCP servers, remote management, and proxy and firewall servers, are covered in depth.

One of the biggest issues in TCP/IP is the next generation of IPv6. These and other future technologies — such as voice over IP — are covered in the book's closing chapters. The appendixes contain the answers to questions posed at the end of each chapter. There is also a large glossary and a reference to all of the draft and standard protocol RFC documents available.

If you aspire to be an IP guru, or just need a reference to the trickier aspects of IP design and implementation, this book will make a good companion.

Lachlan Botticchio

■ Author	Brian Komar
■ Publisher	SAMS Publishing
■ Distributor	Prentice Hall Australia
■ Phone	(02) 9454 2200
■ Price	\$59.95
■ ISBN	0-672-31250-6
■ Rating	★★★★

Using Visual Basic 6: Special Edition

Of all the books about programming languages, those on Visual Basic tend to be the worst, varying from simply annoying

to painful to read. Perhaps because Visual Basic is perceived to be a beginner's language, books on the subject tend to be lacking in information and condescending in their tone. Fortunately, this book doesn't suffer from this affliction to the same extent as some of the others.

The book does begin with a discussion of how computers are controlled by a series of '1s and 0s', but fortunately it speeds up quickly. The first half of the book covers the basics of building Visual Basic applications. It is easy to follow, and the authors do a reasonable job of explaining the underlying philosophies of programming, and not just the use of a particular feature.

Where *Using Visual Basic 6* really shines, however, is in the second half of the book. The topics include creating and using ActiveX controls and connecting to databases. Internet-enabled applications using VBScript and Active Server Pages also receive attention.

One common trap that the authors fall into, however, is occasionally using code examples as the introduction and sole explanation for a topic. For example, a section might ask that you create a form using certain controls and properties, and then explain that you must add some code to enable the controls. Rather than explaining what the code is for, or what it does, the code is simply presented as an end in itself.

Travis Simon

■ Authors	Brian Siler and Jeff Spotts
■ Publisher	Que
■ Distributor	McGills
■ Phone	(03) 9602 5566
■ Price	\$79.95
■ ISBN	0-7897-1542-2
■ Rating	★★★

Off the Shelf

Title	Author	Publisher	Distributor	Phone	Price	ISBN
Expert Guide to Visual Basic 6	Wayne Freeze	Sybex	Addison Wesley Longman	(02) 9428 8000	\$109.95	0-7821-2349-X
Graphic Design on the Desktop: A guide to design for the non-designer	Marcelle Toor	John Wiley & Sons	Jacaranda Wiley	(02) 9805 1100	\$69.95	0-471-29307-5
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High quality at an affordable price, this external unit does not require software drivers & supports up to 1024 x 768 with true colour for both PAL & NTSC systems.

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Cat. No. 2618 **1 Port Printer PCI PnP** \$159

Cat. No. 2619 **2 Port Printer PCI PnP** \$179

Cat. No. 2616 **1 Port RS232 16550 PnP PCI** \$185

Cat. No. 2617 **2 Port RS232 16550 PnP PCI** \$199

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Cat. No. 2657 **8 Port RS232 16550 PnP PCI** \$699

Multi-PC Controller Two Way PS/2

A new low-cost manual two way switch box which allows one keyboard, monitor & mouse to control 2 PCs. Complete with two 3m cable sets to connect between the computers & switch box. Keyboard and mouse emulation is provided for booting under Win95/98 and WinNT.

Cat. No. 11644 **Multi-PC Controller Two Way PS/2** \$465

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- securing confidential data in a safe overnight
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Cat. No. 6049 **IDE Kit** \$111

Cat. No. 6048 **SCSI Kit** \$121

Cat. No. 6200 / 6224 **IDE Tray / Frame Only** \$70

Cat. No. 6201 / 6225 **SCSI Tray / Frame Only** \$76

Cat. No. 6327 **SCSI Fast Wide** \$169

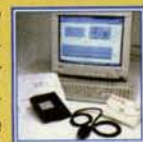
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Even Pentium motherboards are not immune to the Year 2000 bug! The Year 2000 BIOS Card solves the problem of progression from 1999 to 2000 as well as 21st century leap years. It is an 8-bit card which provides year 2000 support for motherboards with a BIOS which only stores the year with two digits. i.e. 97 instead of 1997.

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Perspective: Techno burnout

Burn Rate

Burn Rate documents the brief period of time when you could have been a dog on the Internet, and no-one would ever have known. When it was possible to make ludicrous amounts of money exploiting the naivety of those who wanted to get into this 'Internet thing' but had absolutely no idea why. Put simply, the period between 1993 and 1995 was a goldrush period for those who, like Michael Wolff, had something to sell, and knew how to sell it.

Wolff was the proprietor of a neat line in Internet guides roughly analogous to the famous *TV Guide* in the US, or *TV Week* in Australia. Wolff's company, Wolff New Media, was valuable because companies like Time Warner and Excite thought Wolff knew more about the Internet than they did. These companies also thought that Wolff's properties — the aforementioned Internet Guides — were valuable commodities that would induce the humble online consumer, whoever they may be, to access sites such as Time Warner's Pathfinder.

Burn Rate documents the machinations of these business deals, the characters, the behaviour, and most of all, the massive amounts of money being spent without a profit anywhere in sight. The term 'burn rate' is used to describe this spending:

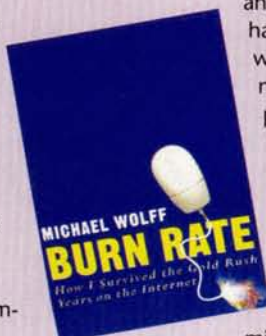
'How many people have you got on staff now?'

'Over seventy,' I say with pride, even though I realise that each person is another parcel the boat cannot handle.

'What's your burn rate?'

'All in, half a million a month . . .'

As a historical document, *Burn Rate* is a moderately interesting read. But it isn't *Bonfire of the Vanities*; it doesn't even get close. The problem is that a documentary of the online industry, when it comes down to it, just can't sustain the tension that's needed to make a reader keep turning the pages. It lacks the historical tension of books like Paul Barry's *The Rise and Fall of Alan Bond*, primarily because the author is so intimately involved in the subject matter. In fact, Wolff is the subject matter, and sadly, he's not a very interesting guy. He paints himself as being somewhat naive —



an interested observer who's almost having out-of-body experiences watching people bid for his business. The simple reality is that probably wasn't the case; Wolff was someone who was in the right place at the right time, and had the ability to document his experiences.

Reading *Burn Rate* is akin to a public declaration of not having a life. Sure, geek chic might be strutting catwalks and hanging on the shelves of clothing stores, but *Burn Rate* goes further than that: it's physical proof that computers aren't very interesting. The avid devotee of business would be better off reading the aforementioned book by Barry. The computer industry devotee, on the other hand, would get more out of Douglas Coupland's *Microserfs*. *Burn Rate* falls nowhere in between.

Josh Gliddon

■ Author	Michael Wolff
■ Publisher	Weidenfeld & Nicolson
■ Distributor	Allen & Unwin
■ Phone	(02) 8425 0100
■ Price	\$24.95
■ ISBN	0-297-64303-7
■ Rating	★★

Technophobia: The psychological impact of information technology

It's no surprise to learn that over half the population suffers from technophobia, a fear of integrating technology — particularly personal computers — into their work and personal lives. Mark Brosnan's book *Technophobia* attempts to explain what it is, who has it and what causes it.

At first glance, the book seems to have the potential to appeal to a broad audience, from parents to the Net generation, from academics to government, and from personal users to corporate users. Open the pages and you'll soon realise the book's appeal is strictly limited to those who are

interested in the academic study of technophobia.

A lecturer in Cognitive Psychology at the University of Greenwich, Brosnan laboriously presents almost every piece of literature and research that has been conducted on the psychological reactions to technology, with very little analysis.

The focus is US-centric, and does not consider trends in other countries. For example, when discussing the increasing number of jobs that require computer skills, Brosnan writes that applications for computer science courses are falling. This is far from true in Australia, where the number of computer science students is increasing at a stunning rate. It is difficult to believe this is not reflected in worldwide trends.

Brosnan is not selective in the research he presents. He quotes research from 1974 that suggests that apparent gender imbalance in acceptance of technology is due to the fact that boys are physically larger than girls, and thus have "superior spatial ability". Even though the author agrees that the basis for this analysis has been severely criticised, he still presents this as a biological factor.

Research into any subject inevitably produces contradictory results; technophobia is no exception. However, Brosnan fails to reconcile any contradictory research. For example, one researcher suggests the percentage of female computer science graduates is falling, yet just a few paragraphs on, the author cites another who found that at an academic level, the ratio of males to females involved with computing appears to be increasing.

While the book presents some interesting research, it fell short of my expectations by not offering the author's opinion on the findings, or putting them into a social context. If you have the energy or interest to plough through the findings of over 600 researchers, then this book is for you. Anyone else could find better things to do with their \$43.

Cathie Kennedy



■ Author	Mark Brosnan
■ Publisher	Routledge
■ Distributor	Jacaranda Wiley
■ Phone	(02) 9805 1100
■ Price	\$42.95
■ ISBN	0-415-13597-4
■ Rating	★★

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or practice your spelling.*

Sporting history

Australian Sport Through Time

Webster's titles always offer a very individual approach, usually have a much more localised bias than US-sourced titles, and are priced very competitively too. Australian Sport Through Time is no different.

The majority of its content is sourced through Random House, which published a book of the same name. The CD-ROM offers a variety of ways to access sporting facts, including a timeline, heroes, a good search facility and, of course, the results. For Trivial Pursuit addicts there is an Odd Facts section, which reveals that one of the founders of AFL football, H Harrison, commented that football was not suitable for poodles and milksops.

The quality of the programs' illustrations and movies is very good overall, but it sometimes pops in a picture when the text or main window subject doesn't really warrant it — or indeed have any relevance to it.

The search engine seemed reasonably fast, but it works from the CD-ROM's index, not the hard disk. This means those with a slow CD-ROM drive might have a lot of thumb-twiddling to do. Overall, the subject matter is remarkably comprehensive, and the researchers have gone to a lot of trouble digging up archive film and newsreels. I must admit I was surprised not to find a picture of Gary Ablett, but most of the coverage is excellent.

Cross-linking was reasonable, if not as slick as Encarta; but given the particular nature of the title, this is not so important.

Where the program does get a bit ragged is in the Sporting Heroes section, where the publishers have aimed for the

personal touch and asked said heroes to write small pieces about themselves ("I first swam competitively . . ."). Obviously, not all responded, so we get very vanilla run-downs on some ("Dooohan first came to notice . . .") which spoils the flow a bit. Nonetheless, if you want Aussie sport on CD-ROM, this is the one.

Jeremy Torr

■ Publisher	Webster Publishing
■ Distributor	Webster
■ Phone	1800 021 201
■ Price	\$69.95
■ Requires	Pentium, Windows, 16M RAM, 2x CD-ROM drive, SVGA
■ Rating	★★★

Dr Seuss Kindergarten

Dr Seuss Kindergarten remains true to the Dr Seuss philosophy of making learning fun, successfully combining familiar zany characters with plenty of nonsense rhymes and music.

Children can explore two divided lands of reading and maths, where enough correct answers in each game allow them to collect strange creatures for Gerald McGrew's new zoo. Most of the games will be familiar to four to six-year-olds, and include alphabet sequencing, simple spelling, odd man out, memory matching and pattern recognition. They are clearly explained and self-correcting, so children who can click and drag will not need any assistance. Two particularly entertaining examples are estimating and matching the height of various weird pets with Dr Seuss objects, and helping the Zinn-a-zu bird complete rhyming songs by clicking on the appropriate word.

Phonetic backup assists letter recognition, and pictures help to build vocabulary. The maths section uses one-to-one representation to aid counting, simple addition and subtraction problems.

There are three self-adjusting levels available in each activity, so the program grows with your child. The progress reporting screen shows how each child is progressing.

Easy installation and navigation make this program a pleasure to use,



and the animation and sound are of excellent quality. The only drawbacks are its limited age range, occasional US-biased references, and in some games, a musical reward or introduction longer than the game itself (the music can be skipped by pressing the space bar). Dr Seuss Kindergarten is a well-produced and educationally sound introduction to reading and maths.

Catherine Howard

■ Publisher	Brøderbund
■ Distributor	Dataflow
■ Phone	(02) 9417 9700
■ Price	\$49.95
■ Requires	486/66, Windows 95, 16M RAM, 2x CD-ROM drive, SVGA, soundcard; PowerPC, 8M RAM, 2x CD-ROM drive
■ Rating	★★★★

MasterClips Email Animator

A picture is worth a thousand words, so the saying goes. Email Animator seeks to put this to the test, allowing you to integrate pictures and sounds into your email, as add-on executable files.

The basic premise of the product is that it should be used primarily for greetings and the like, and thankfully there is an antispam message towards the end of the product manual — the basic mail APC created was around 100K in size! The manual guides you through the basics of creating the animations. Email Animator is not at all complex — everything is set up under big shiny buttons, and it has a cheerful and easy-to-use drag-and-drop interface.

While you can import your own cre-



Interactive News

● The evolution of DVD-related technology continues; STMicroelectronics has released test units of the first single-chip DVD microprocessor. Up until now, DVD units have utilised a four-chip solution to perform the necessary back-end decoding and host-processing functions. If the samples prove to be reliable, the cost to DVD manufacturers of the single-chip solution will be between 30% and 50% less than at present, and should enable faster performance in areas such as fast-forwarding and rewinding.

● DVD-RAM has yet to make its mark, but the potential for the format is huge, for

both the home and business markets. TDK has recently developed the ability to manufacture single-sided 4.7G DVD-RAM disks, almost double the present capacities of a single-sided disk (around 2.6G). TDK achieved this by reducing the mark length of the pits in which data is stored, from 0.61 micrometres to 0.40 micrometres.

● With the continuing growth of DVD-ROM and RAM units, there's good news for those looking for CD-Recorder units. Firstly, they're becoming much cheaper, and secondly, manufacturers are still working on making them faster. American company Smart and Friendly has released a CD-R unit called CD Rocket, which is

able to write CDs at 8x, theoretically allowing a CD to be created in nine minutes. The 8x/20x CD-R is the first of its kind, and though it isn't available locally, other manufacturers are sure to follow.

● Kodak and Intel have teamed up to trial a system called Picture CD, in the US. When photographs are developed, people can purchase a CD-ROM with digitised images of their photographs (for about \$US8 to \$US12), along with the physical prints. Each CD will include software co-developed with Adobe Systems for editing the photographs to remove red-eye and add special effects.

Gareth Jones

ations, there's a wide variety of pre-existing images and sounds, although the MIDI files are very generic — but then most MIDI files are. The program has a Reminder function for special events, although curiously this failed to notice my machine's date, and insisted on repeating that Independence Day (the American celebration, not the film) was just around the corner.

Email Animator's biggest problem is the size of the final product, and the method of delivery: files are typically 50K to 100K, and can be sent either as an executable file, or with a special email animation player attached, both of which will probably have virus checkers and the email-paranoid running a mile. There's also no option to have an animation run only once — events simply loop, which can be annoying.

Overall, Email Animator has some nice ideas and a very friendly interface, but tries to embellish a reliable communication system with bulky attachments.

Alex Kidman

■ **Publisher** IMSI
 ■ **Distributor** IMSI Australia
 ■ **Phone** (02) 9319 7533



■ **Price** \$59.95
 ■ **Requires** 486, 16M RAM, 40M hard disk space, CD-ROM drive, email access
 ■ **Rating** ★★★

Compton's Journey Planner

Who are this title's potential purchasers? A journey planner that helps get you from Newcastle to Brighton might be handy, but from Newcastle, Northumbria to Brighton, Sussex? Slightly less useful. Only the really keen tourist will purchase a CD-ROM that tells them the best way from A to B in the UK.

Right, so that has crossed a number of possible buyers off the list. So it's for tourists. People who would want to get from Heathrow in their hire car to the rolling downs of Northumbria. Entering 'Heathrow' into the program poses no problem. Try 'Northumbria', however, and you'll get a 'No entry, sorry' response. Unless you know the exact name of the destination, then it's no go. And you can't zoom in on the map to get some idea of where things are until you have a basic route established. Catch 22 — casual tourists are out.

Granted, if you ride a bicycle, the program does cater for you, and that's nice. You have your waterproof notebook and lycra pants, you've done the research and know the name of the town you want to go to. It's actually Newcastle, so you can enter that in. But is it Newcastle Shropshire, Gwent, Dublin, Clonmel or Tyne & Wear? Don't know? Well, find out!

OK, you've gone back to school and learned Rutland no longer exists, and



have plotted a course from Heathrow to the land of Newcastle Brown. Check the distance. Just over 280 miles, sounds good.

The route is listed very accurately, travel time just over a day. Fuel cost, just over \$3,000. What?! According to default settings, the program seems to assume the tourist is still travelling by jumbo. That rules out anybody not related to the Sultan of Brunei. OK, I'm being picky, you can change the defaults. And the program does have its uses. Plus there is a section on Europe. But it is still more suited to sales reps in Sierras and Mondeos burning up and down the length of the EEC than potential European tourists. So exactly why it has been released here is a mystery. This possibly answers that original 'who will buy this program' question. Nobody much.

Jeremy Torr

■ **Publisher** The Learning Company
 ■ **Distributor** Roadshow
 ■ **Phone** (02) 9552 8700
 ■ **Price** \$69.95
 ■ **Requires** 386/33, Windows, 4M RAM, CD-ROM drive, VGA
 ■ **Rating** ★

Fewer words and more games this month. You're sure to find a few stocking fillers among this crop.

Jolly holly packs

Battlespire

Battlespire is the long-awaited sequel to Daggerfall, one of the more innovative and impressive RPGs of the last few years. Like its predecessor, Battlespire creates a large interactive world. This environment, coupled with a very advanced and well-designed character development engine, is what made Daggerfall so popu-



lar. But does Battlespire live up to the Daggerfall legend?

Not quite. Despite the transition to higher graphics, Battlespire is still a DOS-based game. This brings with it the complications of setting up a soundcard in DOS, and the limitation of a software-rendered engine. Compared to today's first-person games, Battlespire's lack of 3D hardware support makes its graphics outdated and slow.

It's fair to say that Daggerfall fans may find adventure in Battlespire, especially considering the new multiplayer facet that comes with the game, but it lacks the appeal of its predecessor. The initial release in Australia has been delayed for months now because, although available overseas, it was considered to have too many bugs for the Australian market.

Battlespire is a disappointing sequel to a game that captured many adventurers' hearts. The same attractive gameplay still exists in Battlespire for those willing to delve into it, but for this Daggerfall fan, the game has failed to keep up with the times.

Ashton Mills

■ Distributor	Battlespire
■ Phone	(02) 9417 1322
■ Online	http://www.bethsoft.com/
■ Price	\$79.95

■ Requires	Pentium 133, 16M RAM, CD-ROM drive
■ Classification	M 15+
■ Rating	★

Creatures 2

One quality you need to have to play Creatures 2 is persistence. Only loving, caring people with tons of patience will be successful at this game. Sure, the little Norns that you nurture are very cute, but damn, they can be annoying.

There is no main goal in Creatures 2 except to create a thriving population of Norns and explore the vast landscapes of Albion. You start off with six Norn eggs, which can be replenished if you waste them all. Newborns require a helping hand (your mouse pointer) to learn to sur-



vive. There are also a couple of computers that teach your Norns concepts and feelings. Once they know some of the basics, communicating with them becomes easier. Reward a good Norn by patting it on the head; punish a disobedient Norn with a smack.

The Albion year lasts for eight hours, and has four seasons of two hours each. The average life span of a Norn is 10 hours and after an hour and a half they are able to breed. Each Norn has its own digital DNA, and their intelligence improves with each new generation.

No more than one Creatures 2 game can be played on the same PC, but your creatures can be imported and exported. This feature has opened up the opportu-

nity for proud parents of Creatures to show them off over the Internet.

Kieran McNamee

■ Distributor	GT Interactive
■ Phone	(02) 9902 3000
■ Online	http://www.creatures.mindscape.com/
■ Price	\$69.95
■ Requires	Pentium 166, Windows 95, 32M RAM, 4x CD-ROM drive, 300M hard disk space
■ Classification	G 8+
■ Rating	★★★

Final Fantasy VII

In terms of bang for your buck, you can't get much better than Final Fantasy VII. It is big, 450M big, and takes 30 to 40 hours to play.

Final Fantasy VII follows many of the traditional RPG clichés (small unit versus a tyrannical power, trying to control forces it doesn't understand) and goes one better.

In many ways it is a cross between an interactive movie and an RPG; it switches from character-developing moments (through some stunning AVI footage) to blisteringly fast combat, in seconds. The Japanese have always viewed their RPGs in this fashion (more importance being placed on a cohesive plot than combat), and while

this does make things a little restrictive, there's simply so much to do that it never really becomes a problem.

The graphics engine has been substantially reworked from the original, and the rough-edged polygon look sported in the



PlayStation version has been replaced with much smoother polygons — although the stop-motion sequences seem a little rougher this time around.

One of the only areas where Final Fantasy VII falls down is control: the initial keyboard layout is centred on the number pad, and it's vital to change it to avoid tired and twisted fingers! For an even better result, a gamepad works really well. If you're willing to get into the complicated storyline, and have the space on a system capable of running it, this is a top-notch title.

Alex Kidman

■ Distributor	Ozisoft
■ Phone	(02) 9317 0000
■ Online	http://www.eidos.co.uk/
■ Price	\$89.95
■ Requires	Pentium 166 or Pentium 133 (with 3D Accelerator), 250M to 450M hard disk space, 4x CD- ROM drive, 16-bit soundcard
■ Classification	G 8+
■ Rating	★★★★

Need for Speed III: Hot Pursuit

Need for Speed III is a classic racing game with some terrific extras. You can race around the exquisitely detailed circular tracks in several race modes, or you can gear up with a radar detector and police scanner, and evade the police in Hot Pursuit mode. In a new twist, you can also be the police and hunt down other drivers using an array of sneaky tricks.

There is a wide variety of multiplayer options available, including a split-screen mode where two players can use the same screen at once. If you don't have any friends, playing against the computer can also be very challenging. When you're attempting to evade the police in Hot Pursuit mode, they will do anything they can to get you off the road, even ramming you or trying to push you into oncoming trees.

The version sold locally is a special



Australian version. Even though everything about the game is blatantly American, an HSV and a Ford are included in the line-up of cars to make you feel at home.

The tracks are very detailed, and include side roads and short cuts, but the game sometimes has trouble coping if you get too close to the kerbs. Neither will you get anywhere near the game's full effect unless you have a fast processor and a 3Dfx card.

Josh Mehlman

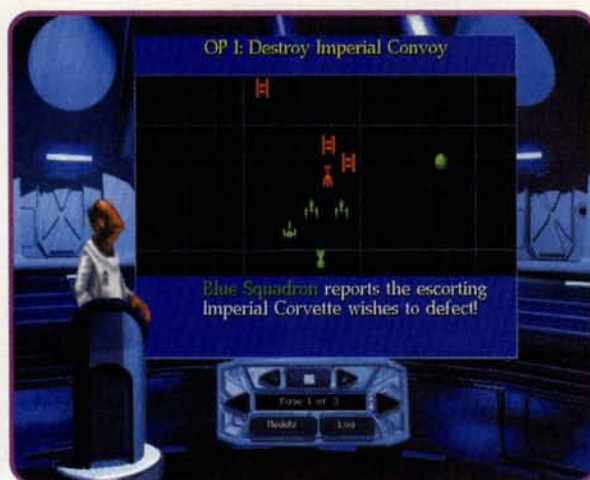
■ Distributor	Electronic Arts
■ Phone	(02) 9955 7744
■ Online	http://www.needforspeed.com/
■ Price	\$49.95
■ Requires	Pentium 166, 16M RAM, 85M hard disk space, DirectX 5.0
■ Classification	G
■ Rating	★★★★☆

Star Wars X-Wing Collector Series

It seems that anything associated with the name 'Lucas' will invariably go through at least three releases — the initial release, the re-release, and the 'extra footage/digitally enhanced' release — all in the name of the almighty dollar. And this is exactly the case with this collector series — just as well the initial games were pretty good.

The collection consists of 3D-enhanced versions of the hoary old classics X-Wing and TIE Fighter, as well as a substantially cut-down demo of X-Wing vs TIE Fighter, called Flight School. In these versions, the graphics setup of the former has been pasted onto the latter, and they are the real meat and bones of this release. Thankfully, the update is worthwhile and the new graphics and sound merge well with the older setup. I dug out my old TIE Fighter floppy disks and installed it just to compare. While the game runs much the same, the facelift is a good one. Needless to say, if you have the originals, then these aren't the droids you're looking for.

If you've never played the originals (where have you been?), then you can look forward to nights spent finishing mission after mission, defending (or attacking) the empire as you move up to advanced TIE Fighters and X-wings. All skill levels are catered for, as is the facility



for cheating — anything from unlimited missiles to invincible ships. Surprisingly, this doesn't detract from the overall game, as there's a great deal of satisfaction to be had from finishing missions properly. The classics age well, especially when they're given digital plastic surgery.

Alex Kidman

■ Distributor	Metro Games
■ Phone	1902 240 527
■ Online	http://www.lucasarts.com/
■ Price	\$69.95
■ Requires	Pentium 90, 16M RAM, 2x CD- ROM drive, DirectX 5.2
■ Classification	G 8+
■ Rating:	★★★

JetFighter: FullBurn

Wow, an old fashioned DOS game! Hasn't Mission Studios heard of DirectX?

FullBurn did run under Windows, but caused problems with my soundcard and Canopus Pure3D accelerator. My solution was to use 3Dfx's reference drivers, but this meant losing the card's TV-out. Many others would discard FullBurn earlier; I was left with no time for multiplayer testing.

It's a pity, because otherwise this game is excellent — a flight simulator set in a tense conflict between Norway (aided by the US) and a Russian splinter group controlled by an ultra-nationalist. You play a pilot of either side, while a B-grade plot develops using C-grade actors, à la Wing Commander.

Flying missions is a joy — ducking and weaving through valleys and over mountains in a jet feels awesome, and is sometimes punctuated by realistic ground fire (though the ground could use more detail). Once, poor wingman AI caused my demise, but this incident also dis-

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played the game engine's accuracy when a wingtip struck my ejector seat, killing me. How's that for collision detection (and bad luck)? As an enemy, AI is better — expect tough dogfights.

If you're a simulation fan with some DOS skills and a 3Dfx card, go ahead and buy FullBurn. I just hope Mission Studios won't hit trouble after investing so much in a game with a limited audience.

Simon Vandore

■ Distributor	Directsoft
■ Phone	(02) 9482 3455
■ Online	http://www.missionstudios.com/
■ Price	\$79.95
■ Requires	Pentium 133, 16M RAM, 4x CD-ROM, 3Dfx recommended
■ Classification	G 8+
■ Rating	★★★

Head Rush

As it is brought to you by the makers of the You Don't Know Jack series, you'd expect this quiz game to feature a sarcastic, wise-cracking host, irreverent — if not downright smutty — humour, and a truckload of frenzied cartoon graphics. And you won't be disappointed.

This time, the scope has been broadened from pop culture trivia to include more educational questions, such as 'What is the centre of a hurricane called?' and 'Name the planets between us and Uranus?'. Of course, they could have cho-

sen Neptune here, but that would have meant passing up the opportunity for a lewd schoolboy-level joke.

This is squarely MTV-style teen humour and it is easy to get distracted from the learning process when asked questions like 'Which word is the preposition in the sentence "Please lick underneath my sweaty armpit"?'.

The game is for one to three players and takes the form of a quiz show. Each contestant is assigned a key to be used as a buzzer, and the questions are generally multiple choice. In addition, at random points through the contest, a mini-game will pop up in which the task might be to match words, or distinguish between categories: 'Are the following words the names of Hobbits or snack foods: Bilbos? Dorritos?' and so on.

Adults might be amused by this game for a short while, but it is really aimed at young teenagers who are meant to find the scatological humour, twisted cartoons and punchy soundtrack a palatable way to swallow a dose of education.

Jon Gill

■ Distributor	Dataflow
■ Phone	(02) 9417 9700
■ Online	http://www.headrush.com/
■ Price	\$49.95
■ Requires	Pentium, Windows 95, 16M RAM, 2x CD-ROM drive, soundcard; PowerPC, System 7.1, 16M RAM, 2x CD-ROM drive
■ Classification	M 15+
■ Rating	★★★★

iF/A-18E Carrier Strike Fighter

Everyone loves to fly planes, especially if you can have all the excitement with no physical danger. iF/A-18E Carrier Strike Fighter is a very realistic flight simulation that provides all the thrills.

Starting any new flight sim is always an arduous task, and that's why it's imperative to read the manual from cover to cover. Once you have studied the manual, and learnt to fly your plane in the training missions, you can undertake individual missions or enrol in a campaign. Missions vary from air combat to the protection of allied naval forces. The TALON (Total Air and Land Operations

Network) system generates unique objectives for each mission, so no mission is the same. Of course, multiplayer games are available via modem, LAN or the Internet.

Realism settings such as invulnerability, unlimited ammo, and even the black-outs caused by excessive g-forces can be toggled on and off. An indicator at the bottom of the screen rates the degree of diffi-



culty with the current realism settings. The graphics settings can also be adjusted extensively and a sliding bar measures the performance trade-offs against the quality of the graphics.

Carrier Strike Fighter has many features, one of the most impressive being the ability to speed up time. Maybe it's just me, but hastening the speed at which you approach a distant enemy by up to eight times certainly removes some of the tedium that usually comes with longwinded missions.

Kieran McNamee

■ Distributor	Directsoft
■ Phone	(02) 9482 3455
■ Online	http://www.imagicgames.com/
■ Price	\$79.95
■ Requires	Pentium II 266, Windows 95, 32M RAM, 12x CD-ROM drive, 3D graphics card, joystick
■ Classification	G 8+
■ Rating	★★★

Correction

In our November issue, the distributor details for Heart of Darkness were incorrectly recorded. These should be:

■ Distributor	Roadshow Interactive
■ Phone	(20) 9552 8700
■ Price	\$89.95
■ Classification	G 8+



We review the companion Web sites to three well-known TV shows.

TV times three

Burke's Backyard

'Burke's Backyard' is one of those TV shows, like 'The Late Show with David Letterman', in which the presenter's character is such an important part of the show, it's difficult to imagine the show without them. 'The Late Show' without Dave usually ends up being a pale imitation of itself; 'Burke's Backyard' without Burke just wouldn't be the same either.

Which is what makes the Burke's Backyard site quite odd: Don's almost nowhere to be seen. He does stare, gnome-like, from the top of one or two pages, and models some of the merchandise, but that's about it. No 'G'day, I'm Don Burke' WAV files, no animated GIFs.

Multimedia is pretty thin on the ground, with the notable exception of the intro page, which plays the show's theme as it loads. But the Web version isn't the same version of the theme that's played on the show — this one sounds like Uncle Arthur from 'The Comedy Company' has been let loose on his organ one last time. It's absolutely hilarious and worth hearing even if you've no interest in gardening, pets, home ownership or celebrities.



The site parallels the content of the TV show, with sections titled 'In the garden', 'Home among the gumtrees', 'Road tests' and so on. The content from the current week's show is made available on the front page, while all the material from previous weeks is available in archives which stretch back almost two years.

Burke's Backyard really deserves commendation for making these fact sheets and the other content available in archives. The ABC's otherwise fabulous

'Consuming Passions', hosted by the irrepressible Ian Parmenter, removes recipes after two weeks. Other infotainment shows are similar in this way.

The reason for this stinginess is often the desire of the show's producers to make more money through book sales, T-shirts and other merchandise. Their sites, then, are simply nothing more than a marketing teaser to promote additional sales. Burke's Backyard, surprisingly, doesn't ask visitors for anything. There are no subtle BUY! hints scattered in the fact sheets. No-one is forced to fill out demographics forms before access is given, and third-party products aren't relentlessly spruiked.

Marketing execs would probably be horrified by this lack of push. A jaded Web File even has to confess to a certain degree of mystification, but we're not complaining — it's so refreshing, and so undemanding that it appears to run contrary to every TV-linked Web site we've ever seen. Even the overall site design would probably load quite fast over a 14.4K modem. Declare us knocked over with a feather!

With two years' worth of content, the site could do with a search engine. Assuming no rabid marketing types get their hands on the site in the near future, the growth in content will make it increasingly difficult to locate specific information. Burke might also want to consider adding security to its merchandise page, and adding a way for visitors to subscribe to the magazine — preferably without compromising the site's homely appeal.

Josh Gliddon

■ Online <http://www.burkesbackyard.com.au/>

■ Rating ★★★★★

The Movie Show

Are you a Margaret person or a David person? 'The Movie Show's' dynamic reviewing duo — Margaret Pomeranz and David Stratton — provide the dramatic tension that has sustained 'The Movie Show' for years. Without the pair, and their less-than-star-struck approach (Richard Wilkins, are you listening?), 'The Movie Show' would be just another review program.

Reviews are the lifeblood of the show,



and fortunately the Web site reflects this with a reasonably comprehensive archive. The reviews themselves are simply transcripts of whatever Margaret or David said on air, with their 'star' ratings.

It's unclear how far back the review archive extends; certainly not as far back as the banner on the news page which proclaims its 'Since 1986' provenance. What this means is that if you're going to get a video, you've already got something in mind, and it was released in the last 18 months, 'The Movie Show' site will probably have a review.

This tactic is a little self-defeating, though, if you consider that you'll probably already have a pretty good idea of what a recent movie is about. But remember, 'The Movie Show' is more about what Margaret and David *think* about the movie than it is about the movie itself. The archives, therefore, make an effective storage for M and D's opinions, and will surely come in handy when they decide to research their memoirs.

One problem with the most current reviews, which have their own location, is the odd frameset format. First-time users may get confused, wondering where the review subjects are, until it becomes apparent that the right-hand-side scroll bar must do something! Once you've come to grips with that, the rest of the site is easy.

The remainder consists of three parts: a weekly interview, industry news, and a preview of the following week's program. The weekly interview is in streaming audio and uses the Vivo format, as do the video previews for the current week's movie reviews. If you don't already have the Vivo plug-in, you'll need to get it, which

involves leaving the site, as SBS isn't courteous enough to make it available on its server. A less obscure format would probably have made a better choice.

An interview archive would make a positive addition to the site. It's unclear whether copyright prevents this, or whether no-one's got around to it yet. It's a pity, as the interviews would make a valuable resource.

'The Movie Show' site doesn't provide a compelling reason to visit. It lacks the electricity of the show, and doesn't provide enough resources to make it a good research tool.

Argus McPhee

■ **Online** <http://www.sbs.com.au/movieshow/>

■ **Rating** ★★★

Getaway

'Getaway' is a top-rating TV program tied to a strong Web site and a popular magazine. It's rare that the essence of a TV program is distilled so completely as it is at the Getaway site — down to GIFs of Catriona Rowntree in various states of undress at exotic locales throughout the world.

Getaway is part of the massive NineMSN portal site, and as such it's strongly oriented towards selling value-add services such as hotel rooms, international and domestic flights, and car hire. The site's shop facility seemed to work reasonably well (although we didn't go as far as actually booking a holiday, unfortunately), but it did seem to confuse domestic and international airline flights. Either that, or we got confused trying to make it see the distinction between the two.

In any case, it could be a little easier to use than what it was. As with all online services, the guiding principle is caveat



emptor, as it's difficult to be certain that the airfare deals on offer are the best available. Any prospective holiday-maker would be well advised to consult several other online travel sites, as well as a ter-

Surfbaud: New media

Terms like 'information superhighway' are bound to fall into disuse or have their meanings twisted to the point where they no longer bear any relation to their origins.

'Standard' is a great example. Before World War II, standard was something that set a benchmark for quality or performance. After the war, standard had morphed into a word used to describe something that was regular issue, such as 'standard fitment'. There was a British automobile company called Standard, and the change in the use of the word was a significant contributor to its downfall in the 1950s.

Even today, five years after Al Gore coined the term 'information superhighway', its use is scorned by the digerati (woops, there goes another one).

'New media' hasn't yet become a victim of this linguistic tall-poppy syndrome — APC even has a 'New Media Coordinator'. Problem is, no-one has really figured out what it is that 'new media' describes.

It could be argued that The Movie Show, Getaway and Burke's Backyard are all new media because they're available online, but this ignores the fact that what they deliver is essentially available through several other outlets, including magazines, 0055 numbers and free-to-air TV.

None of those sites does anything 'new', or exploits the Internet in a truly groundbreaking way. New media, then, could be said to be old media delivered in a different way. New media is more about an access regime than the content available through that regime.

restrial agent or two, simply to compare prices.

Getaway's just as much about the idea of travel as it is about actually going somewhere. Armchair travellers are reasonably well catered for. Solid coverage is given to numerous travel locations searchable by location, activity or other keywords. The information on offer isn't in-depth, but it's colourful and well accented by screen shots taken from the TV stories themselves. Those after more comprehensive information are advised to consult Lonely Planet or settle back with a Paul Theroux travelogue. Better still, get on a plane with some traveller's cheques, a backpack and a change of clothes, and discover what the country is like first-hand.

The only real criticism is that the locations chosen seem to be influenced more

Steve Vamos, managing director of Internet portal site NineMSN, conceded this point in a recent interview with **Newsire**. Vamos said that TV and magazine 'properties' are responsible for driving overall traffic to the NineMSN site. These TV shows and magazines are also responsible for creating the brand-awareness that encourages NineMSN users to trust the material presented at the site. "We could create the best money site in the world, but who's going to go there if it doesn't have a [recognisable] brand?" Vamos asked in an unpublished section of the interview.

The underlying message is that the Internet, despite the computers, browsers and general whizz-bangery, isn't that far removed from TV, magazines or even radio, except that computers are much harder to use than a TV channel selector, and infinitely more complicated than flipping a magazine page. Unsurprisingly, this was the case with TV during its 1950s infancy. Back then, many of the TV programs were based firmly on established radio conventions, especially in the case of game shows, or upon the conventions established on stage and on the movie screen. It wasn't until the late 1950s that TV came into its own with series like 'I Love Lucy'.

Inevitably, the same transformation will happen to the Internet, and it will spawn its own, unique forms of expression, as well as providing an alternative mode of consumption for existing ones.

Josh Gliddon

by which company was willing to pay travel and accommodation expenses than by any sort of journalistic consideration. This is probably fair enough, but there are no disclaimers on the site stating that the presenter travelled as a guest of Corporation X. More to the point, there are no negative reviews (at least none that we could find) of any country, resort or location.

Getaway's other useful features include traveller's tips and hints, and a 'club' whereby members can be informed of deals. Frequent travellers may find the club useful, especially as many of the fares offered are short notice.

A solid representation of the TV show.
Deanne McIntosh

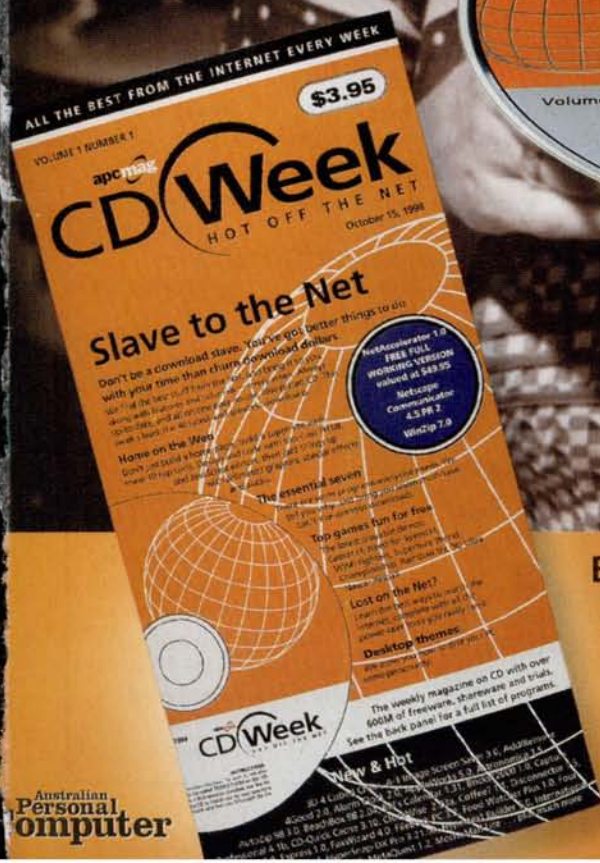
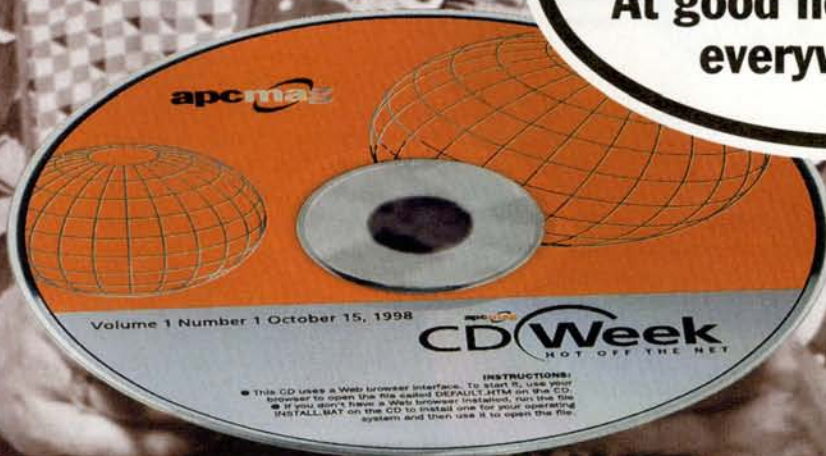
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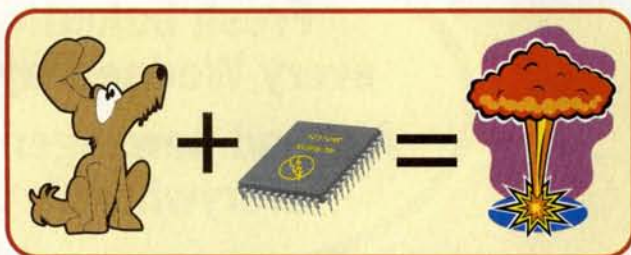
*We went down south to see if we could unwind, and we could,
but then we just had to wind ourselves up again.*

Chip Chat

"They could just explode"

Every word of what you are about to read is true. We couldn't make this stuff up if we tried.

The mayor of Coffs Harbour Council in northern NSW is arguing that the introduction of microchips in pets is only the first step in the control of humans. Mayor John Smith said that his council has deferred acting on the Carr government proposal to begin microchipping all pup-



pies and kittens from next year. He said the council was concerned that many pet owners would find it difficult to meet the cost of fitting their pets with microchips.

But that's not all. According to Smith, microchips are unstable and could expose wired animals to many other dangers. "The chips could have anything in them, they could just explode," he told APC's **Newswire** service last month.

Smith said that the microchip proposal is just the first step in the control of humans. He also pointed to other technologies such as fingerprint and optical identification as examples of "Big Brother" at work. "It's really getting to the stage where you're losing your personality and your rights."

The mayor admitted microchips would probably be a "very good tool" if used properly, but said he doubted that humans could be trusted with such technology. "The whole principle of the thing is that it's open to abuse. We would never know what's in the chip," he said.

And as for the pets? Because the microchip plan is enshrined in law, local councils must eventually accept it. In the meantime, Coffs Harbour Council has written to the Department of Local Government expressing its strong dissatisfaction with the proposal.

Newswire asked Smith for his solution to the problem. "Have a good fence around your house. Train your animals. It's just a matter of common sense."

Silent partners

Gateway has overcome an extended period of coyness regarding its partnership with Telstra Big Pond as part of its Your:)Ware "own your own PC for a fraction (2/1) of the normal cost" scheme. Telstra had been widely rumoured to be the partner for the company for some months, but Gateway proved surprisingly resistant to any attempts to actually announce the partnership.

After calling a press conference specifically to discuss its partnering arrangements, Gateway chickened out at the last minute, with the questionable defence that no-one in the US cared who the partner company was so why should we be any different? A week later, and after persistent nagging by the APC team, an anonymous mole notified the staff that checking out a Web site with a 'bigpond.com' domain would provide the solution — as indeed it did.

Since advertisements had already appeared in a number of major publications promoting the scheme, complete with the Big Pond logo, we can't help wondering: why the veil of silence?

Check the facts

Speaking of questionable PR activities, we were also amused by a recent email scam that purported to warn readers that if they answered their mobile and then dialled '#90', they would then find that their phone could be remotely controlled and used for illicit calls. Not that there's anything new about email as a medium for urban myths, but several major companies, including an IT PR firm, passed on the message, complete with a totally false assertion that Telstra had verified the story. (For the record, Telstra described the story as "completely untrue".)

The search for truth

This month's bizarre search engine fact: if you search for the words 'Linux', 'mayonnaise' and 'illegal activity', you won't find anything. However, with the rapid development cycles available using the open source model, we predict it's just a matter of time before a page covering these topics emerges.■

Contest: Technology gag of the month

We appreciate the continuing flow of jokes into the Chip Chat gag tray, but we would like to say that we don't need any more copies of the joke about Bill Gates, God and the end of the world. (If you don't know what we're talking about, get yourself an email account, it'll show up sooner or later.) This month's winning joke comes from Martin Carroll.

Q: What's the difference between God and a systems administrator?

A: God doesn't walk around thinking he's a systems administrator.



For his efforts, we'll be sending Martin a rather tasteful Computer Associates/ACT Brumbies polo shirt. Send your jokes — the shorter and funnier the better — to chipchat@acp.com.au (and please include your snail mail address so we can send you a prize if you win). If we publish your joke, you'll receive a special prize from our extensive collection of industry miscellany.

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